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Fires Aloft

FIGHTING a conflagration high above the street in open building construction is a formidable, not to say impossible, task for a city fire department. Burned-out ladders and stairs, lack of elevator service and falling blazing members make such a fire unapproachable once it gets a good start. Consequently, if construction on high buildings is to be secured against fire, protection must be supplied wholly by the contractor, without dependence upon city fire apparatus. This fact was again emphasized by the recent spectacular blaze that destroyed seven floors of forms and planking above the fourteenth story of a New York building. In this case, as would be the case in other similar situations, efforts of city firemen to reach the seat of the blaze were futile. Construction fire hazards are ever present; watching over them requires the contractor's constant vigilance and care, supplementing an adequate fire-control system.

Recognition in Another Field

WHEN the Board of Health of North Carolina last week summarily discharged H. E. Miller, in spite of state-wide protests from engineers and industrial leaders, the action evidently did not lessen Mr. Miller's standing in the field of work wherein he had achieved wide recognition for effective results. His twelve years of work as chief engineer of the board meant much for the state in which he worked, as we pointed out two weeks ago. Almost immediately upon his discharge comes news of his appointment as supervising engineer of rural sanitation for the entire nation under the United States Public Health Service. In view of the unexplained nature of his dismissal from the state service, the recognition of Mr. Miller's work and abilities in another and larger field of work is all the more welcome. He will carry into the national sphere the same abilities that brought such excellent results in state work, despite constant opposition from individual members of the medical profession, and from local politicians. North Carolina loses by the change, but the country at large is the gainer.

Ten Years Ahead

PREDICTIONS that automobiles capable of sustained road speeds of 75, 80 and even 100 miles an hour will soon be in stock production were freely made at the last meeting of the Society of Automotive Engineers. The natural reaction to such announcements is one of consternation; surely present speeds of congested highways are quite sufficient to satisfy all but the most foolhardy. Yet it must not be forgotten that a century ago a railway speed of 15 miles was regarded as suicidal by contemporary authorities, and that even the past decade has witnessed a 50 per cent increase in the normal, conservative touring pace. What reason is there to assure us that the ultimate maximum has been reached? After all, highway safety is a relative term, dependent upon three factors—car, driver and road. The S.A.E. is confident of the manufacturers' ability to produce cars capable of safe high speed, and past experience shows that the average driver can be educated to faster travel. The road factor depends upon proper design and adequate construction—it behooves our highway designers to look well to the future.

Rates Fixed by Contract

A RATE of fare fixed by contract cannot be changed by a regulatory commission unless the contract so stipulates. That, in brief, is the unanimous finding of the New York State Court of Appeals in its decision denying the authority of the state transit commission to increase fares on the subway and elevated lines in New York City. The five-cent fare in New York was fixed in 1912 by a contract between the city and the Interborough Rapid Transit Company under an amendment to the state's rapid transit act. Three years ago the company attempted to raise the fare, and carried its case into the federal courts, only to have the U. S. Supreme Court decline to pass upon it because it was primarily a matter for the state courts, as the interpretation of state laws was involved. The highest state court now reaffirms the inviolability of a contract in no uncertain terms. It is upon firm ground when it takes this stand. A rate fixed by a public utility commission may be changed by the commission or by a court, but a rate fixed by contract into which all parties have entered voluntarily is in a different class. It must be lived up to unless all parties to the contract are agreed among themselves that it should be changed. This distinction needs to be impressed upon those who have to do with the establishment of utility rates. Too frequently they are inclined to enter into rate agreements which appear temporarily advantageous, in the belief that if the agreement turns out to their disadvantage it can be voided by resort to the courts. As we have said repeatedly, fewer inequitable contracts will be made when both parties realize that the contract is to be held binding upon them until fulfilled.

A Water-Supply Lesson

COMPLETION of a new water-supply system for Albany, N. Y., formally celebrated last week, is of far more than local significance. Times without number cities have changed from a polluted to a relatively pure source; but more than this is taking place at Albany. A slow sand filtration plant is being abandoned that marked a new era in water treatment; a plant that was courageously pitted against a water heavily burdened with the sewage of near-by cities known to be responsible for a heavy toll of typhoid deaths: a plant, too, that had to deal with considerable turbidity at times. After some decades of use of the old slow sand filters, eventually supplemented by prefiltration and chlorination, the proponents of a "naturally pure" upland gravity supply won the day. Meanwhile water standards had so far changed that the state authorities demanded immediate filtration of the new supply. Meanwhile, too, rapid filtration had made such advances that it was adopted for the new plant. From the viewpoint of today, the significant facts brought out by the experience of Albany are first, that grossly polluted water supplies, even when thoroughly treated, are no longer tolerated by the public; and second that the day is rapidly coming when all surface water supplies will be filtered, as for some years nearly all of them have been chlorinated. There are still a number of cities with supplies as badly polluted as is the Hudson at Albany. They are sure to follow the example of that city in the near future.

A Notable Highway

ITS cost of half a million dollars a mile places the Mount Vernon highway described in this issue in the classification of superhighways. It has even greater claim to this rank because of its width and strength of paved surface, its exceptional devices for traffic separation, accession and distribution, and its enormous yardage of borrowed embankment. The hydraulic fill across streams and marshlands amounted to almost five million yards and to a fourth of the construction cost. Probably no other highway fill has an equal yardage in two and three-quarters miles of road; certainly no hydraulic fill of so great a yardage has been employed elsewhere. But engineering distinction is more in the studious planning of the traveled roadway for free traffic flow under all conditions of accession, intersection, turning, halting, diversion and distribution which the vagaries of sightseeing and excursion travel develop. Local widening and division of roadway have been made to play a controlling part in merging and shunting traffic currents without diverting or confusing the main stems of traffic flow. At the terminal where the great bulk of the travel is reversed, after halting and parking from a few minutes to several hours, special ingenuity is exhibited in the multiple-loop system, which permits free parking and ready movement of vehicles from and into main traffic streams. In magnifying the terminal the Mount Vernon highway forecasts a requirement that will develop increasingly as metropolitan highways are carried out to resort and sightseeing points.

Discretionary Power Essential

The duty of a public service commission to protect the interests of the utilities over which it exercises control as well as the interests of the public has been clearly restated in Connecticut by Superior Court Judge Alfred C. Baldwin in dismissing a complaint brought by the Attorney General of the state for the removal of the state's public service commissioners. Connecticut law requires that railroads eliminate each year at least one grade crossing for each 50 miles of track within the state, but it gives the commission authority to modify this requirement if the financial condition of the railroads will be adversely affected by so much crossing elimination work. The commission has exercised this discretionary power in recent years by reducing the number of eliminations required of the New Haven railroad, the only important railroad affected by the law. As a result, two years ago action for the removal of the commissioners for neglect of duty was begun by the Attorney General upon the petition of 100 electors. Judge Baldwin's dismissal of the complaint is the outcome. It vindicates the commissioners. In concluding his statement Judge Baldwin said: "If I were to make any criticism of these officials, based upon the mass of evidence presented in the case, it would be that in their high conception of their public duties and zeal to serve and protect the public they have, during these recent and extremely trying years for the railroad company, required of it the elimination of more crossings than under the circumstances was fairly reasonable." Not infrequently our state commissioners appear to have erred on the other side through favoring the interests of the utility companies in their decisions. Judge Baldwin's findings after a searching inquiry into the work of one such commision not only helps to restore confidence in our commissions but also serves to emphasize the fact that grade-crossing elimination places so great a burden upon the railroads of the country as to make it essential that utility commissions be given wide discretionary power in enforcing crossing-elimination laws.

Tunnel Precautions

SEVERAL recent occurrences in compressed-air tunneling bring out a strange variety of possibilities of accident in such construction. The Chicago sewer tunnel fire of April 13, a later lock failure at Yonkers, and on July 19 the submergence of a tunnel drift at Milwaukee by heavy rainfall, constitute a group of incidents each rare in tunnel history, and still more rare in such close conjunction. They direct attention to the demands of safety in both installation and operation of tunnel work. Any possibility that the working arrangements might interfere with hoisting, transportation, air supply or passage through the lock may spell disaster. Yet it is important in such intricate work that equipment and methods be kept simple. It is easy to carry precautions beyond the point where they are effective. Precaution that is in some respects excessive may be found in Chicago, where after the fire that cost eleven lives elaborate safety provisions were installed by the Sanitary District, for which the tunnel is being built. They include fireproof headhouse, elevators and ladderways, and a second or emergency exit to the surface from the compressed-air heading, all in accord with the recommendations of the coroner's jury (*ENR*, April 30, page 744). Fireproof construction for headhouses and shaft equipment is practicable, and possibly advantageous, though timber construction is the general rule and has never been a source of fire danger, not even in the Chicago case. Installation of emergency exits from the air headings is a questionable device, however. In most tunnel work it is quite impracticable. Even in the case of shallow street tunnels, such as that at Chicago, the emergency exit is apt to be a delusive resource, unless made familiar to the workmen and kept in continuous operating condition by daily use. Tunneling can be made safe without dependence on two separate passages to the surface. Since in all but a few instances there is no possibility of providing such second exits, safety is better served by concentrating attention on the regular working devices and methods.

Leadership in Industrial Cooperation

A STEP significant to the entire field of industrial cooperation, and particularly to that in the realm of construction, has been taken by the cement industry in selecting a head for the Portland Cement Association *from without the industry*. The new departure implies—and we say it with no lack of appreciation for the past work of the association—a transformed and broadened view of the relations between producing industry and public. The cement industry orients itself upon a more comprehensive public service, in which the user and the public are included together with the producer. Because this represents a definite response to modern industrial needs, the change is likely to become a precedent and to serve as a model to other industries in the service of construction.

Industry relations have for some years been growing steadily in the direction of broader cooperation. Experience has consistently shown that industrial welfare and stability depend on integration of the whole industrial field, of all the groups comprised within it. The obsolete view that an industry is the exclusive concern of the producers has been replaced by recognition of the inescapable community of interest among producer, user and public. They are like three legs of a stool, mutually interdependent and equally essential to the whole. And, as a corollary, there has developed a new understanding of the function of industrial cooperation: to serve the common need of these three. Only in so far as it performs this service can cooperation achieve its end.

We are yet in the period of evolution of industrial cooperation. Very few industries have succeeded in gaining fully the new outlook, and still fewer in building their cooperative work accordingly. The industries in the field of construction are largely still preoccupied with the older individualistic or producer-interest concepts, and have much work to do in developing and modernizing their associations. If the progress of the Portland Cement Association along its new course will hasten this work, the organization will add a new distinction to that which its achievements in research and promotion have won for it.

What the association has gained is not so much a new principle of organization, however, as a new leadership. And this is preeminently important because, like most human activities, industrial cooperation depends first of all upon the men who guide it. Their inspiration and wisdom spell success, or the opposite. The high promise that attends the present change is due to the personality of the man chosen to fill the office of president. We feel confident to speak of his qualifications, because of years of association with him—Edward J. Mehren, long editor of *Engineering News-Record*, and since then a vice-president of the McGraw-Hill Publishing Company. Detached from cement interests, but with remarkably wide acquaintance among both users and producers, with intimate knowledge of the broad field of engineering and construction, with instinctive appreciation of public sentiment and needs, he brings to his new duties that impartial observation of problems and that sympathetic balance of view and judgment upon which the effectiveness of industrial-association activity necessarily rests. No one could better than he transform into reality the ideal of joint interest of all groups in the sound advance of the cement industry.

That our hopes and good wishes go with him need hardly be said. But we claim a line or two to express our regret and sorrow at losing him from the field of technical journalism—a brilliant mind and a strong hand, our long-time leader, collaborator and friend. His personality was impressed deeply upon *Engineering News-Record* from its very beginning. What he wrought as editor will remain a foundation stone of the paper's existence. Our farewell to him is joined with the confident expectation of even greater success in the larger task he now takes up.

Law, Engineering and Construction

WITH 1931 hardly more than half over, it has already become notable for decisions by the United States Supreme Court establishing basic principles applicable to interstate conflicts over the use and abuse of interstate waters. Close on the heels of the Connecticut and Delaware river decisions upholding the principle of equitable interstate division for beneficial use of the waters of those streams came a fundamental decision of similar practical effect as regards the Boulder Dam enterprise on the Colorado River, and an equally fundamental decision protecting New Jersey shore communities from the results of New York City's dumping hundreds of thousands of tons of garbage and other refuse into the ocean to be washed up on the beaches along the New Jersey coast.

In the garbage decision the courts swept aside as immaterial New York's contentions that the refuse was dumped outside the waters of New Jersey or the United States, and that the operation was conducted under the permit and jurisdiction of the federal supervisor of New York Harbor. The decision rests solely and squarely on the court's acceptance of the master's findings that New York garbage was swept and piled up on New Jersey shores to the damage of its bathing beaches and fishing industries and to the money cost of the municipalities for the removal of the material.

Aside from establishing more strongly than before the basic principle of protection of interstate waters against pollution—a principle which is applicable to other nuisances involving two or more states—the New York-New Jersey garbage decision has little practical importance, for ocean disposal of garbage and refuse is rarely practiced in the United States or other countries and, even if it were, nowhere else would the injury to the people of another state be so great. New York City utilized that means of disposal in earlier times, but abandoned it many years ago and returned to it, as a supposedly temporary expedient, partly for political reasons. A program for the substitution of incinerators having been under execution for some years, the local effect of the decision will merely be to speed up the program. This speeding up will presumably accelerate the adoption and extension of sound engineering methods of garbage and refusal disposal throughout the country.

The three water utilization decisions cited are highly important acts in support of sound engineering, aside from their local meaning. They will support and extend construction work which in the total will run into scores of millions. Contrary decisions would have had the opposite effect. Thus at a crucial period of business depression good law and good engineering join hands to create and support the construction work and with them a host of dependent manufacturing and other industries.

The Mount Vernon Memorial Highway

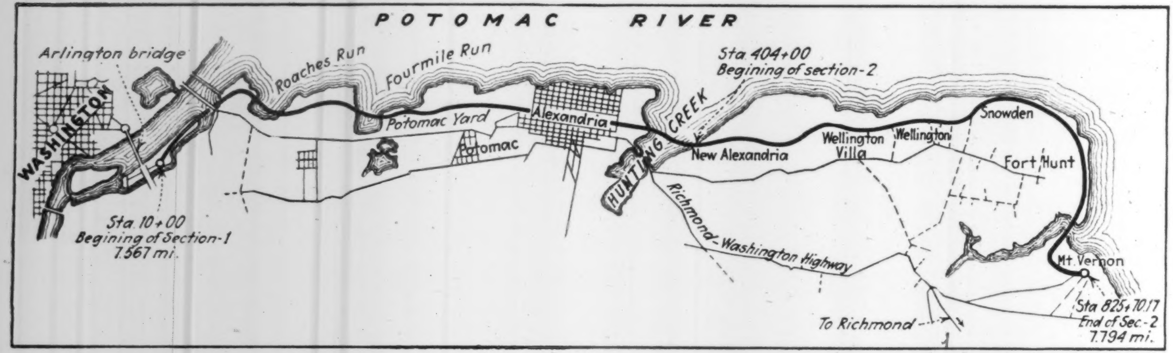


Fig. 1—Map of route of Mount Vernon memorial highway

A 15-mile four-lane paved road of superhighway type being built from the national capital to the home of the first President in celebration of the bicentennial of his birth

As a Memorial to George Washington to be completed upon the celebration next year of the 200th anniversary of his birth, Congress in 1928 authorized and provided money for the construction of a monumental road from the nation's capital to Mount Vernon, the home of its first president. The construction of this road is now well advanced under the direction of the Bureau of Public Roads. It will cost about $6,000,000, exclusive of right-of-way and supplemental park land acquisitions, and will exemplify modern practice in road structure and construction. Its route is generally along the Potomac River from the Virginia end of the Arlington Memorial Bridge to the gates of Mount Vernon, passing through Alexandria—Washington's own town, his market place, his post office, his voting place and his place of worship. This route was selected as the one best fitted to take advantage of the scenic possibilities of the river and the one closest in contact with the places that were associated with Washington's family and business life. It also had the practical advantage of affording generally light grades and easy curves, although it involved remarkably large filling operations on the Potomac mud flats. Because of its design and construction, as well as for its memorial purpose, the Mount Vernon memorial highway commands attention among America's notable undertakings in highway construction. —Editor.

The Mount Vernon memorial highway is notable for elaboration of road structure and the large volume of fill required at crossings of estuaries from the river. It is paved the full length of 15.361 miles for four lanes of traffic, with widenings at places to six and eight lanes, and has a graded width for six lanes from Washington to Alexandria. Intersections, access roads, lookout points and the terminal at Mount Vernon introduce various special road structures for facilitating the flow of traffic. In general the road is of superhighway type, conservatively monumental in conformity with its memorial purpose and historic location.

Alignment and Structures

The location of the road is shown by Fig. 1. It is one of easy grades and curves until, at the southern end, the climb into the hills introduces a few short 4, 5 and 6 per cent grades and one short sharp rise of 7.4 per cent, which is practically absorbed in the long vertical approach curves. In this part of the route also is one curve of 925-ft. radius approaching the terminal at Mount Vernon; but generally curves are under 3 deg., and all curves are spiraled to give easy flow lines for traffic and are superelevated. Alignment, in brief, follows the latest practice in providing for traffic ease and speed. From the construction viewpoint the location deserves mention primarily for the inlet crossings, which involved a major task of embankment building and bridge construction.

Grading Sections—From the Arlington bridge to Alexandria the road is graded 72 ft. wide for 60-ft. pavement, and from Alexandria to Mount Vernon it is graded 52 ft. wide for 40-ft. pavement. The side slopes are not greater than 1 on 2 in stabilized ground and not greater than 1 on 4 on hydraulic fill. The special features of the grading profile are: (1) intersections of cut slopes with the natural ground surface area rounded; (2) the roadway grade is crowned with enough surplus material in the crown to build the shoulders by moving the excess laterally when preparing the subgrade; and (3) the topsoil is stripped and stockpiled for resurfacing the slopes after the road is paved and shaped. In general, all grading is done so as to provide for grassing and planting; borrowpits, for example, are kept shallow and have rounded dressed slopes. A representative grade and subgrade profile is shown by Fig. 2.

Pavement Design—Both rigid and flexible types of pavement are employed. Generally the pavement on new fills, where settlement is likely and therefore a flexible surfacing is advisable, is bituminous concrete, and on stabilized ground it is a rigid type—reinforced concrete or asphalt on reinforced-concrete base. As most of the road south to New Alexandria (Fig. 1) is on new fill or in city streets in Alexandria, the rigid-type sections were asphalt surfaced to correspond in surface and color with the bituminous concrete on new fills. The pavement, with the exception of the section through Alexandria, is therefore uniformly blacktop to New Alexandria and thence is concrete to Mount Vernon. The section through Alexandria is sheet asphalt on a plain concrete base.

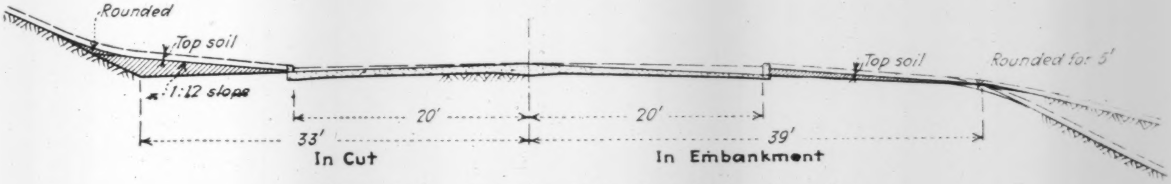

Rounded
Top soil
1:12 slope
20'
20'
33'
39'
In Cut
In Embankment
Top soil
Rounded for 5'

Fig. 2—Section showing typical grade and subgrade profiles

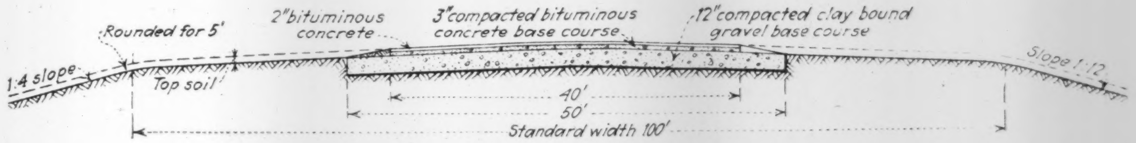

Rounded for 5'
2" bituminous concrete
3" compacted bituminous concrete base course
12" compacted clay bound gravel base course
1:4 slope
Top soil
Slope 1:12
40'
50'
Standard width 100'

Fig. 3—Bituminous-concrete pavement on hydraulic fill

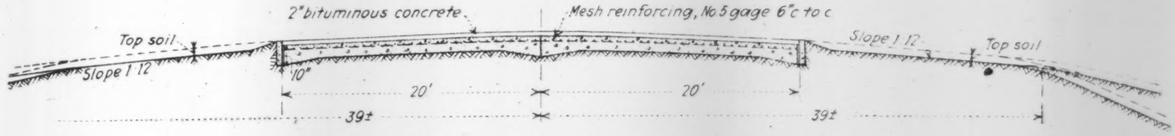

2" bituminous concrete
Mesh reinforcing, No 5 gage 6" c to c
Top soil
Slope 1:12
Slope 1:12
Top soil
10"
20'
20'
39±
39±

Fig. 4—Bituminous-concrete pavement on concrete base

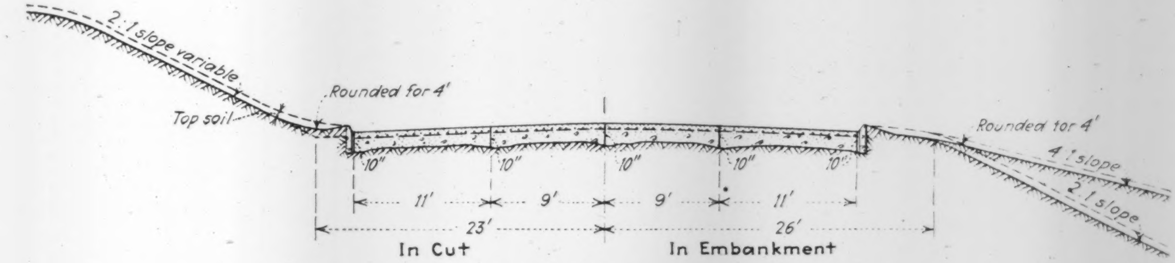

2:1 slope variable
Rounded for 4'
Top soil
10"
10"
10"
10"
10"
11'
9'
9'
11'
23'
26'
In Cut
In Embankment
Rounded for 4'
4:1 slope
2:1 slope

Fig. 5—Reinforced-concrete pavement

On Columbia Island, which is essentially a park development, the pavement is 60 ft. wide between riser curbs of concrete and consists of a 2-in. compacted bituminous-concrete surface on a 3-in. base or binder course of the same material on a 4-in. compacted dry choked-stone base on 12 in. of compacted gravel extending 2½ ft. beyond the pavement edges. Approaching the cloverleaf intersection at the crossing of the Washington-Richmond highway the 60-ft. pavement splits into two 40-ft. roads that converge beyond the cloverleaf at about Gravelly Point into the normal 40-ft. section to Alexandria. The normal section on hydraulic fill is shown by Fig. 3 and that on stabilized ground by Fig. 4. Through Alexandria the road is city street with a 56-ft. sheet asphalt pavement on plain concrete base. Then sections shown in Figs. 3 and 4 alternate to about New Alexandria, where the reinforced-concrete pavement (Fig. 5) continues to the Mount Vernon circle. In round figures there are about 21,700 ft. of blacktop on concrete base, 21,200 ft. on gravel base and 38,600 ft. of reinforced concrete.

Concrete base and pavement, sheet asphalt and bituminous concrete conform to the regular high standards of the Bureau of Public Roads specifications, and need not be particularized. The clay-bound gravel and dry choked-stone sub-base and base courses, being less common and of exceptional specified quality, deserve particular mention. The reader is reminded that these are bases for new fill, largely hydraulic, in which the fill material is gravel and sand.

A clean gravel up to 3-in. stone is required to be placed on a shaped and trenched subgrade to the depth and profile shown by Fig. 3. This is covered with 2½ to 3 in. of clay having a cementing value of not less than 50. The clay and gravel are then mixed by plowing and harrowing to full depth until a homogeneous mixture results. Water is added as required to secure the best mixture and binding value of the clay. The mixed material is rolled to full compaction with a three-wheel, 10-ton roller and then planed to profile by a 1½-ton blade grader having an 8-ft. blade. The finished surface is required to vary from profile not to exceed ½ in. when tested by full-width transverse templet and a 10-ft. straight-edge applied longitudinally.

Stone for the body of the dry choked-stone base ranges from $1\frac{1}{2}$ to 3 in. and for the filler from $\frac{1}{4}$ to 1 in. The body stone is spread and rolled to compaction. Then the filler is applied in thin layers and swept and rolled until the voids are filled without any fine material being left on top. The surface is required to gage within $\frac{3}{4}$ in. when tested by templet and straight-edge.

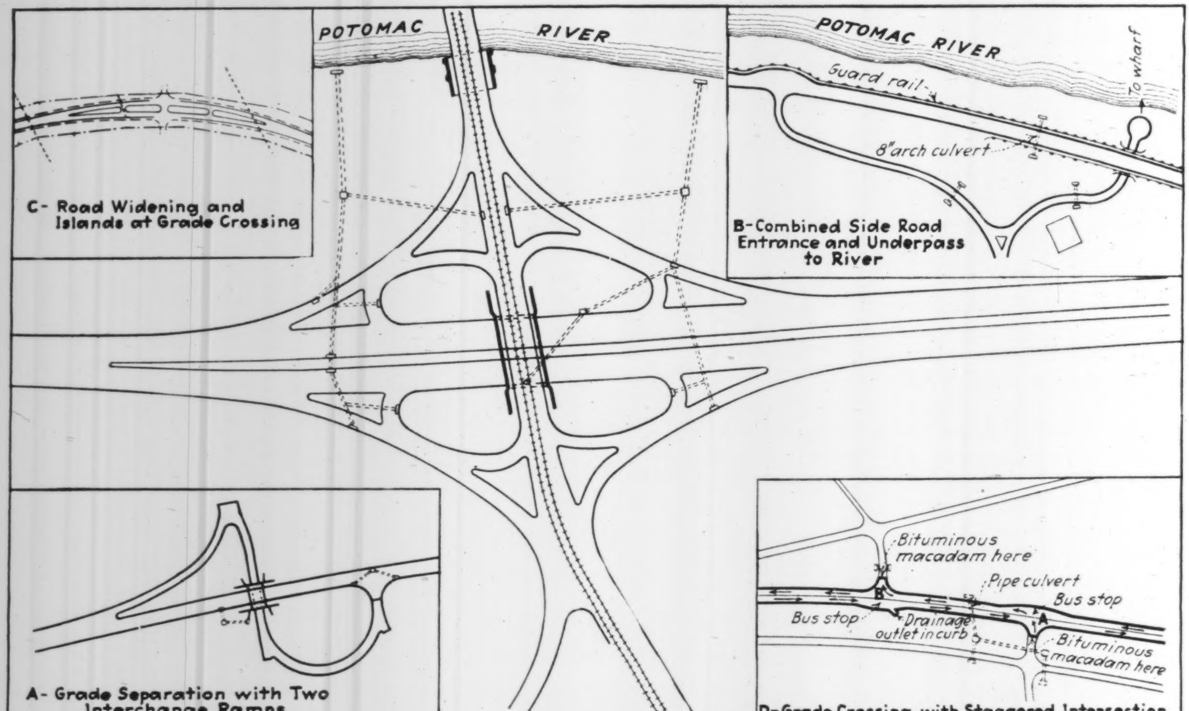
All pavement structure is of notable strength. On Columbia Island, where the dry choked-stone base is introduced, the depth is 21 in., and for the normal section on new fill it is 17 in. All concrete base, except street pavement in Alexandria, is reinforced and of 10:7:10-in. section in 20-ft. slabs. With the 2-in. bituminous top the minimum slab thickness is 9 in. The standard 40-ft. concrete pavement is two 11-ft. and two 9-ft. slabs, each 10:8:10-in. section, and it is especially strong.

Special Structures—To provide free flow of traffic and also to serve the inclinations of a traffic composed largely of sightseers and excursionists required an exceptional variety of roadway structures such as bus stops, turnouts, parking areas and devices for separating and distributing intersecting, accession and turning traffic. Accession traffic from residence developments along the road had to be so provided for that it would enter the main traffic stream with the least interruption. Again at Mount Vernon terminal provision was required for reversing traffic and for parking large numbers of cars and scores of excursion buses so that they could quickly leave and enter the traffic stream.

Owing to the location of the road close to the river there are few highway intersections. Except in Alexandria, where city traffic conditions and speed limits exist, most of the highway traffic coming onto the road is accession traffic and not intersecting traffic. At the one major intersection where, near the north end, the present Washington-Alexandria highway crosses the new road a grade separation and cloverleaf arrangement of ramps provide interchange of traffic. This arrangement is shown by Fig. 6. The new highway passes under the existing road and through traffic on both has clear ways. Interchange traffic is handled by the cloverleaf ramps, so that distribution in all directions is possible without left turns or crossing. Approaching the cloverleaf, the new road is split by an island into 40-ft. roads; this provides an effective way of preventing left turns and gives extra width for departing and entering traffic streams, with correspondingly less disturbance of the through streams. Incidentally, the drainage system of this intersection, as shown by Fig. 6, is worth noting.

A type of minor grade separation is shown by Fig. 6*A*. This is one of several instances where provision is made for possible future development of traffic between the main road and the river. As the interchange is likely to be of small volume, only two connecting ramps are provided. Another grade-separation access to the river combined with an entrance road to Fort Hunt is shown by Fig. 6*B*. An old Fort Hunt road to a wharf on the river was the real reason for the grade separation, but advantage was taken of necessity to provide a parking circle and a stand giving an attractive river view.

Where minor cross-traffic warrants only intersections at grade, two plans of handling the traffic are indicated by Figs. 6*C* and *D*. Fig. 6*C* is a crossing where the roadway can be divided and separated by wide islands. This type of crossing has its most pleasing application on curves sharp enough to permit widening for the separated roadways and to keep a natural easy-flowing alignment. Crossing traffic and also turning traffic at intersections of this type accomplish their purpose in two operations. A break in the traffic moving in one direction permits crossing to the island, and the turn or crossing is then completed at the first break in the traffic moving in the opposite direction. To aid turning, each half of the divided roadway is widened by an additional traffic lane. Where widening and division of the roadway are not



C- Road Widening and Islands at Grade Crossing

B-Combined Side Road Entrance and Underpass to River

A- Grade Separation with Two Interchange Ramps

D-Grade Crossing with Staggered Intersection

Fig. 6—Types of grade separations and crossings

possible staggered crossings have been used, as shown by Fig. *6D*. Entering vehicles cross one line of traffic as at *A*, then travel with and weave across the other line to an exit at *B*. The distance provided for this crossing and weaving movement is approximately 400 ft.

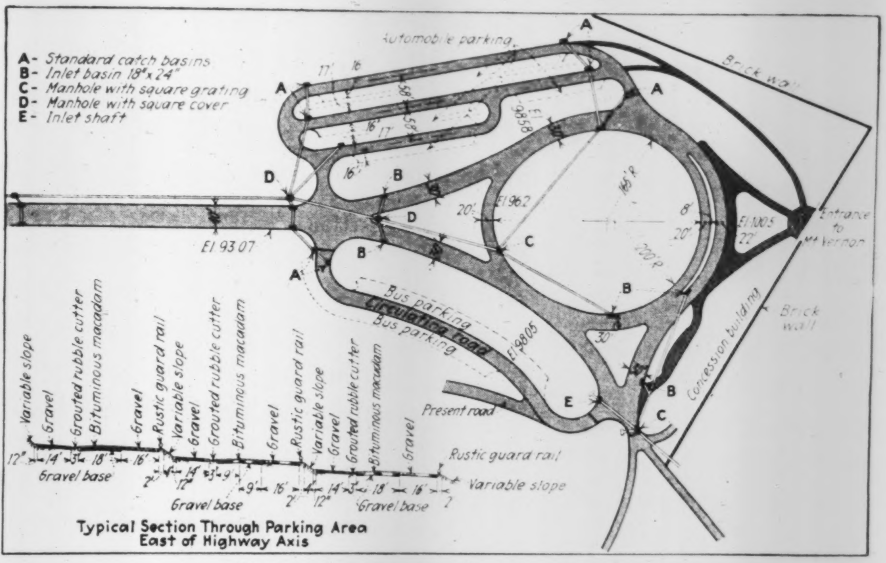

A- Standard catch basins
B- Inlet basin 18"x 24"
C- Manhole with square grating
D- Manhole with square cover
E- Inlet shaft
Automobile parking
Brick wall
Entrance to Mt Vernon
Brick wall
Concession building
Bus parking
Circulating road
Bus parking
Present road
El 93.07
El 96.2
El 98.58
El 98.05
El 100.5
165' R
200' R
20'
8'
20'
22'
30'
17'
16
16'
17'
58'
58'
16'
A
A
A
B
B
B
B
C
C
D
D
E
Variable slope
Gravel
Grouted rubble cutter
Bituminous macadam
Gravel
Rustic guard rail
Variable slope
Gravel
Grouted rubble cutter
Bituminous macadam
Gravel
Rustic guard rail
Variable slope
Gravel
Grouted rubble cutter
Bituminous macadam
Gravel
Rustic guard rail
Variable slope
12" 14' 3' 18' 16' 2' 4' 14' 12" 3' 9' 9' 16' 2' 4' 12" 14' 3' 18' 16' 2
Gravel base
Gravel base
Gravel base
Typical Section Through Parking Area
East of Highway Axis

Fig. 7—Plan of terminal at Mount Vernon

At the Mount Vernon terminal, provision was required for reversing traffic for the return trip, for unloading traffic, for large parking areas for cars and buses and for circulating roads connecting the parking areas and the main road. The arrangement adopted is shown by Fig. 7. Essentially, it is a Y merging into a full traffic circle flanked by loops of circulating roads inclosing parking areas. Separate parking is provided for 350 automobiles and 60 buses. The main circle and its Y approaches are paved with concrete, and the circulating roads with bituminous macadam on a compacted gravel base. The parking areas are compacted gravel oiled to prevent dust. A section through the parking area east of the main X and circle is shown in Fig. 7. The circle and west parking area are substantially the same elevation transversely but on a rising grade from north to south. This topography called for special drainage, as indicated by Fig. 7.

Throughout the route there are many widenings for bus stops, road entrances and temporary parking places for views of the river. In places these viewpoints are complete riverside loops. In general, wherever access or stopping traffic will occur, there are pavement widenings or loops to prevent congestion. Extensive landscape planting and treatment will be undertaken, and the plans provide for the lighting of the highway along its entire length.

Construction Methods

Construction methods have been exceptional only in the foundations for bridges and in the hydraulic-fill embankment. Grading has been particular work because of the requirement for dressed and curved slopes and the separate excavation and stockpiling of topsoil; but paving, which has just been started, will involve only the usual conditions and requirements for the various types. Rigid specifications for quality and workmanship will be enforced unless they demand equipment or procedure not ordinarily available.

Bridge Construction—The bridges, except two, are concrete-arch structures. The largest, at Hunting Creek, is shown in half-elevation by Fig. 8. Except one brick-faced arch, all arch bridges are faced with randome-coursed stone and dimensioned granite, as indicated by Fig. 8. The unusual structural feature is the use of timber struts at footing level between the foundations. These are expected to carry any possible distorting thrust of the fill from abutment to abutment. They are used only where the opening has deep mud bottom and is through hydraulic fill.

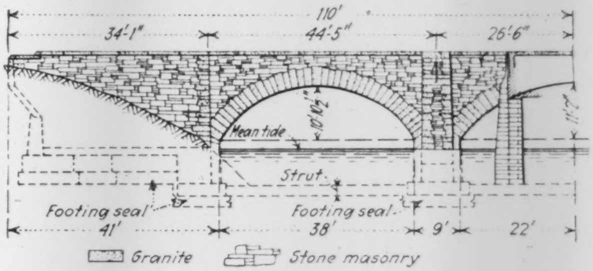

110'
34'-1"
44'-5"
26'-6"
10'-10½"
11'-2"
Mean tide
Strut
Footing seal
Footing seal
41'
38'
9'
22'
Granite
Stone masonry

Fig. 8—Elevation of bridge at Hunting Creek

To stabilize the foundations further at these openings, the mud is excavated, and after foundation piles are driven the substructure is backfilled.

Hydraulic Fill—The location of the road over the mud flats and estuaries bordering the river involved a major embankment operation. Including the crossing of Little Hunting Creek near Mount Vernon, the aggregate length of hydraulic-fill embankment was 2.75 miles, and the volume of fill was from 4½ to 5 million cu.yd. The fill was on a mud bed 10 to 30 ft. deep. It was carried out endwise from the shore, shutter pipe being used. The material was a clean sand and gravel pumped from the bed of the river. A special effort was made to obtain this character of material so that the embankments would stabilize with the shortest possible time. The work was done by the U. S. Engineer Corps, and government dredges were used.

Personnel

The contractors for the road were: grading, drainage and incidental construction, Vincent Schiavi, Buffalo, N. Y.; bridges, Merritt-Chapman & Scott Corp., New York City; paving from Arlington Memorial Bridge to New Alexandria, MacDougald Construction Co., Atlanta, Ga., and from New Alexandria to Mount Vernon, Roberts Paving Co., Salisbury, Md.

The design and construction are under the direction of the Bureau of Public Roads, Thomas H. MacDonald, chief. The work is in direct charge of R. E. Toms, principal highway engineer, and J. W. Johnson, district engineer.

A Structural-Welding Fabricating Shop

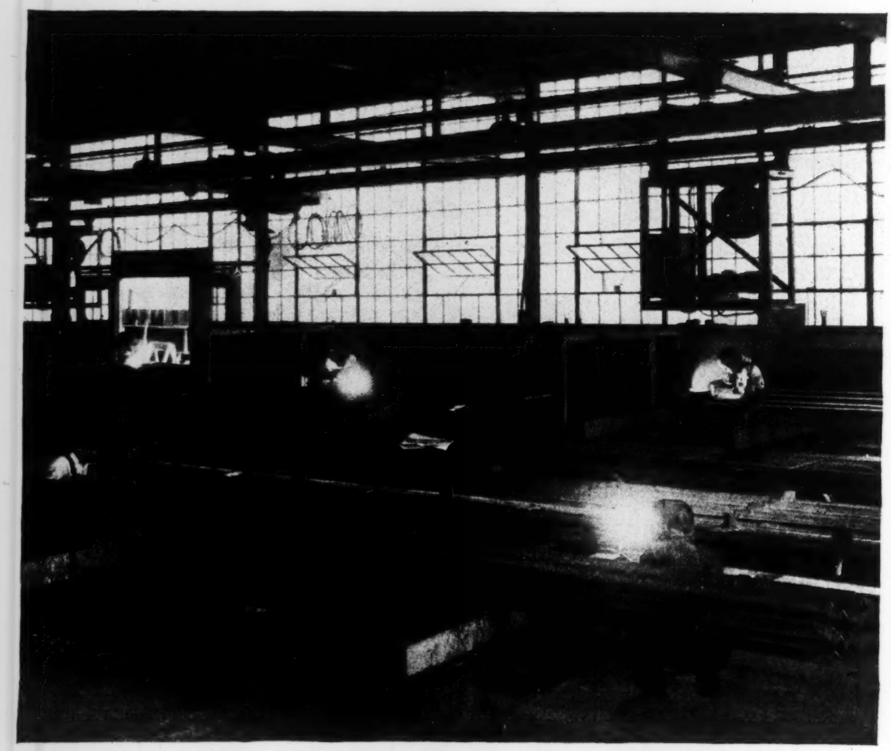
By HARRY E. STITT
Chief Engineer, The Austin Co., Cleveland, Ohio

CONTINUING improvement in welding and welding design foretells an increasing demand for welded steel structures. In order to meet this demand the Austin Co. has completely equipped its Bliss Mill plant in Cleveland for the straight-line production of welded fabricated steel. This plant has a monthly capacity of 1,000 tons of welded steel and 1,800 tons of riveted steel.

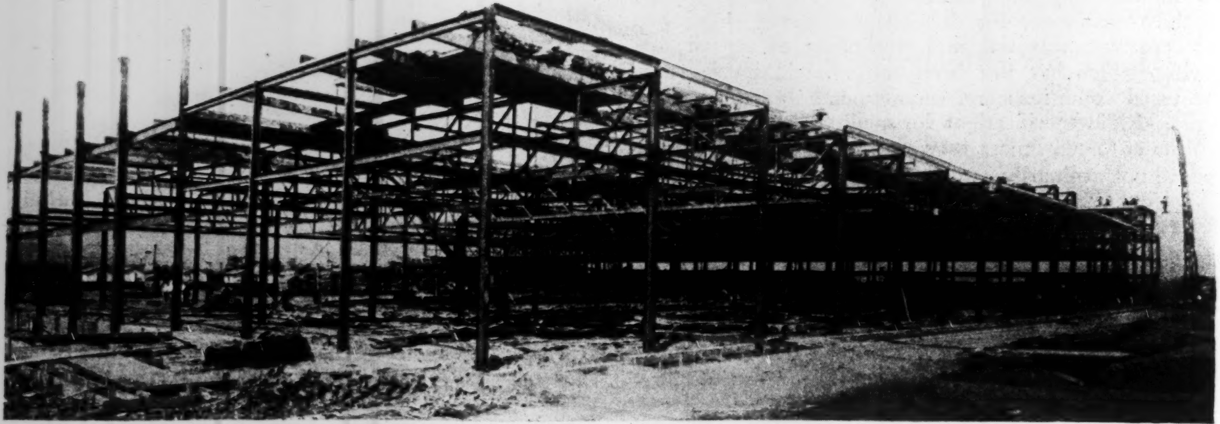
Initial operations for welded or riveted fabrication are identical. Members are cut to length by a high-speed friction saw (24-in. beam capacity) in a shear shed at the side of the crane-equipped stock yard. This same shed houses a plate shear and a double-angle shear. After cutting, the stock is carried through the shop in straight-line production to the point where final assembly occurs, which is the dividing line between the riveting and welding departments. A row of punching machines is located in the line of travel, so that erection holes can be punched in welded work.

Work that is to be shop-welded without jigs is laid flat on an assembly bed, where the pieces are tack-welded sufficiently to hold them together. They are turned over as they move to a bed in the next bay for the final welding, which is done by two semi-automatic 400- to 600-amp. arc machines and four single-operator 300- to 400-amp. portable machines. The semi-automatic machines are suspended overhead on a hand-operated trolley, providing for both longitudinal and cross movement. Each one serves an area 40x40 ft.

Assembly jigs, which are used wherever warranted and particularly for trusses, are made of angles fabricated in a form to fit the member to be welded. The jig is laid flat on the assembly bed, and the pieces forming the outer members of the trusses are laid just inside the angles of the jig. The members rest against stops welded to the angles and are held in place during welding by clamps or clips. Cross members are laid directly above similar members in the jig and are similarly



Attaching details to columns and purlins by hand welding
Bliss plant of Austin Co. at Cleveland.



New 1,000-ton all-welded building for General Electric Co. at Cleveland was fabricated at the Bliss plant

clamped. With the use of the jig several trusses or other duplicate units can be welded in the same time that it takes to weld one unit without this device. Jig welding was particularly advantageous for a large job recently completed, involving 136 flat trusses, 70 ft. long and 10 ft. deep in the center, and 65 parallel-chord trusses, 40 ft. long and 9 ft. deep in the center, to be used for the new windowless factory of the Simonds Steel Industries, Fitchburg, Mass. The total tonnage was approximately 425 tons and was fabricated and welded in about three weeks. In the past six months this shop has turned out about 1,100 tons of welded steel.

◆

Railroad Fill Across Swamp Confined by Steel Sheeting

By A. D. DUFFIE
District Engineer, New York Central Railroad, Albany, N. Y.

IN CROSSING a swamp 1,200 ft. wide, near Graham, N. Y., in the construction of a new line on the Putnam division of the New York Central Railroad, some method of stabilizing the railroad fill was necessary because of its proximity to a new highway. A short time prior to the starting of construction of the new railroad the Westchester County Park Commission placed the filling for the new highway across the swamp, carrying the fill from 3 to 4 ft. above the ground level. The highway fill subsided considerably during its construction, causing a mud wave and a lateral movement of the ground under the proposed location of the railroad. The center line stakes of the railroad location moved about 10 ft. out of line away from the highway fill.

Borings taken along the proposed railroad line showed a bog of soft decayed vegetation from 10 to 40 ft. deep overlying a bed of sand and clay. The railroad company realized that to attempt to place the railroad embankment directly on the swamp would create a further mud wave and serious disturbance to the new highway, which is adjacent and parallel to the railroad at this point, the distance between the adjacent toe and the slope being 40 ft. It was also obvious that such a fill would not be stable under railroad loadings.

Several schemes were considered, and it was finally decided to confine the material under the track with two lines of heavy steel sheetpiling tied together with 2½-in. anchor bolts, spaced 8 ft. apart. The piling was to be held in line with 12x12-in. creosoted timber waling. The two rows of sheeting are 27 ft. apart. The sheetpiling was driven to a penetration from 10 to 15 ft. in the clay and sand beneath the bog, and the top cut off on an even line 1 ft. below subgrade. The tie-rods were placed 4 ft. below the top of the sheeting. Details of the construction are shown in Figs. 2 and 3.

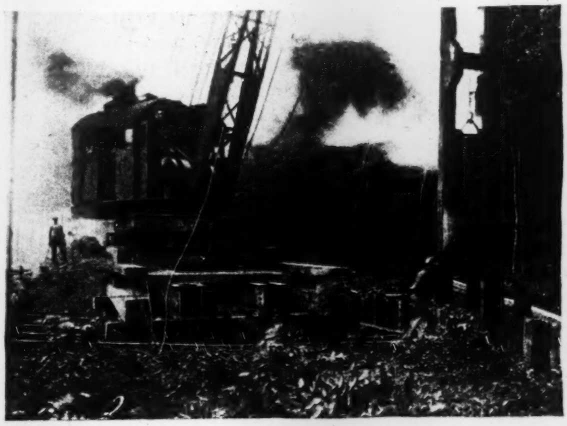


Fig. 1—Driving steel sheetpiling to confine railroad fill through swamp, New York Central Railroad

The sheeting was driven and the waling placed by a locomotive crane traveling on a temporary trestle of steel I-beams resting on pile bents on 20-ft. centers. The top 4 or 5 ft. of muck was removed from within the lines of sheeting and replaced with gravel fill below the subgrade of the roadbed.

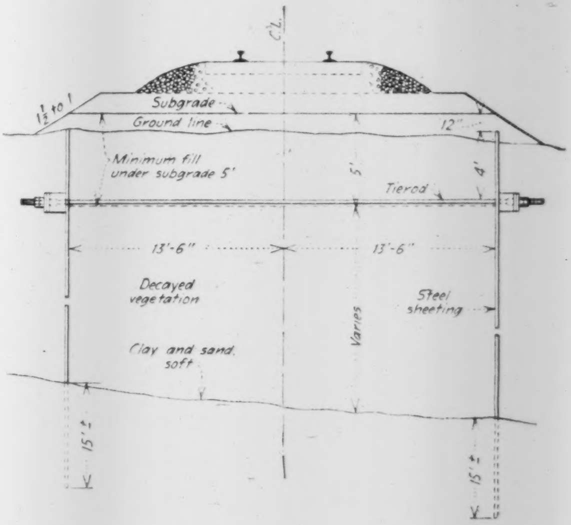


Fig. 2—Two rows of steel sheetpiling driven deep into firm material and tied together keep swamp muck from flowing under railroad fill

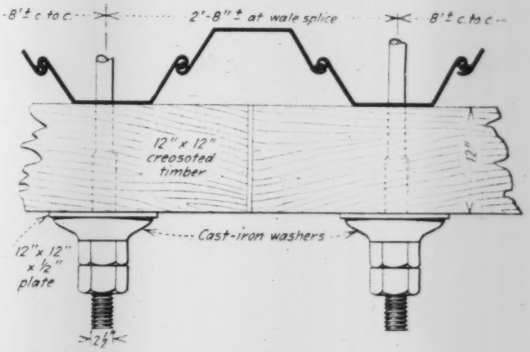


Fig. 3—Framing details of wales and piles

Except for a slight initial settlement there has been no subsidence of the fill through this area. The track has held up under traffic remarkably well, and there has been no sidewise displacement of material or any indications of a mud wave on either side.

The new railroad line was built under the supervision of F. B. Freeman, chief engineer of the railroad, and under the direction of the author as district engineer.

Can Cement Durability Be Predicted?

Investigations show that Merriman's method of prediction is not positive and needs correlation with field results

By E. T. CARLSON and P. H. BATES
Bureau of Standards, Washington, D. C.

How to Predict the resistance of cement to disintegration in service has been a prime problem of cement study for several decades. Merriman's recent proposal of a sugar test, related to a conception of completeness of combination of the constituent materials of the cement mixture, was supported by a substantial showing of agreement between the test and an accelerated disintegration by sodium sulphate. But a check on this evidence at the Bureau of Standards now shows a disconcerting "shotgun" scatter of results—see the diagrams. Because of the Washington laboratory's high rank in cement study this finding challenges the utility of the method. —Editor.

The data presented herewith were obtained in a study of the method of testing cements suggested by Merriman as "a measure of the extent to which the constituents of a cement have been combined in that it determines their resistance to the sugar-lime solution." He claimed that the method is "a criterion of the completeness with which a cement has been manufactured." ("Durability of Portland Cement," Thaddeus Merriman, *ENR.*, Jan. 9, 1930, p. 62.)

Merriman's Method—The method consists of shaking 7.5 grams of cement for two hours with 100 milliliters (ml.) of sugar solution containing lime (15 grams of ordinary table sugar dissolved in 100 ml. of tenth-normal lime water) and filtering. A 25-ml. aliquot portion of the filtrate is titrated with half-normal hydrochloric acid, using first phenolphthalein and secondly methyl orange as indicators. It is assumed that the first end-point is reached when the lime alone is neutralized, and that the difference between the two titrations represents the amount of acid required to react with the iron, alumina and silica in the solution. This difference in milliliters of acid is called "the index of disintegration."

At the time of carrying out his titrations Merriman also immersed neat briquets made of the cements in question at the age of seven days in a 10 per cent solution by weight of anhydrous sodium sulphate. He then found that the higher the disintegration index the more rapid was the rate of disintegration of the briquets in the sodium sulphate solution. He worked with 32 cements; the briquets of all but nine failed in the sodium sulphate solution in less than two months. The index of these nine, with one exception, was close to 5.8.

A Check Study—In the check study herewith presented 138 samples of cement representing 24 brands, made in 31 mills, were used. The samples were selected from among those being tested from time to time at the laboratory of the Bureau of Standards in connection with government purchases. These samples were treated according to Merriman's method. However, 1 : 3 standard sand briquets instead of neat cement briquets were stored in the 10 per cent sodium sulphate solution. The temperature was maintained at 70 ± 2 deg. F., and the solution was renewed monthly. The briquets were removed as soon as they showed marked signs of disintegration. Complete analyses of the various cements were made also, and their compound composition was calculated according to the method suggested by Bogue (R. H. Bogue "Calculation of the Compounds in Portland Cements," Analytical Edition, *Indust. & Eng. Chem.*, Vol. I, No. 4, p. 192), in order to note any relation existing between such composition and resistance to disintegration or between composition and Merriman's index. The data obtained are presented in the accompanying table.

In a number of respects the results bear out the predictions of Merriman. The "indices of disintegration" obtained for the various cements range from 1.0 to 11.7, most of them falling between 6 and 10. Of 50 samples that withstood the sodium sulphate action for three months or more, only five had an index above 7.0; of 42 samples that disintegrated within two months, only three had an index below 7.0. Although this indicates that, in general, those cements having a low index are more resistant to the action of sodium sulphate than those with a high index, the variation is so great that it is impossible to predict the behavior of a given cement from its index. For instance, of two samples having an index of 7.1 one disintegrated in 2 months and the other in 4½ months. Those cements whose indices were between 6 and 7 showed similarly divergent results in the sulphate solution. Those samples that were removed from the solution at the end of 60 days had indices ranging from 6.3 to 10.0. The variation is shown more clearly in Fig. 1, where the indices of the various cements are plotted against the length of time that 1 : 3 standard sand briquets, made from the same cements, remained in the solution before disintegrating.

After Merriman had commented on the relation between alumina content of the cements and the disintegration index, a similar correlation was attempted and a somewhat similar relation was found between the resistance to disintegration and the calculated percentage of tricalcium aluminate in the cements. Those that had a high tricalcium aluminate content as a rule were the first to disintegrate. However, as seen in Figs. 2 and 3, the results varied so much as to be of little more value than indicating a general trend.

Inaccuracies of the Method—The method and its relation to the disintegration of the briquets is subject to many inaccuracies. The first end-point in the titration is not permanent, and the reappearing pink color is partly obscured by the ferric hydroxide that is formed. The second end-point is hard to see because the solution has usually assumed the same color as the indicator; in practice it was found just as satisfactory to dispense with the methyl orange indicator and titrate until the solution became clear. The time taken for a titration undoubtedly has a great effect on the results. The concentration of the acid is very low, and as a result the reaction between it and the iron and alumina takes place rather slowly. This may be shown by titrating one of the solutions until it is nearly clear and allowing it to stand. In a minute

CHEMICAL ANALYSES, DISINTEGRATION INDEX, CONSTITUTION, ETC., OF THE CEMENTS INVESTIGATED

Brand	Bin No.	Days In Na_2SO_4	Index	Chemical Analysis, Per Cent								Constitution, Per Cent			
				CaO	MgO	Al_2O_3	Fe_2O_3	SiO_2	SO_3	Ig. Loss	Free CaO	C_4AF	C_3A	C_3S	C_2S
A	1	60	10.0	64.7	1.7	6.6	3.1	20.5	1.7	1.7	0.4	9	12	52	20
A	2	92	8.1	64.7	1.7	6.7	3.1	20.2	2.0	1.7	0.7	9	12	52	19
A	2	60	7.8												
A	3	84	8.8	64.9	1.3	6.4	3.0	20.4	1.7	1.5	0.6	9	12	54	17
A	4	82	8.6	64.6	1.4	6.4	3.1	20.2	1.7	1.6	0.4	9	12	55	16
A	5	58	9.0	65.3	1.3	6.3	3.0	20.5	1.6	1.0	1.0	9	12	55	17
A	5	58	9.1												
A	6	53	8.9	65.0	1.6	6.5	3.1	20.4	1.7	1.3	0.5	9	12	55	17
A	6	60	8.5												
A	6	63	8.8												
A	7	71	10.0	65.3	1.6	6.4	2.9	20.5	1.7	1.4	0.1	9	12	58	15
A	8	60	7.8	65.0	1.7	7.1	3.1	20.1	1.6	1.3	0.5	9	13	53	17
A	9	63	9.0	65.3	1.9	6.4	3.2	20.1	1.6	1.2	1.9	10	11	54	17
A	10	80	9.0	65.7	1.7	6.7	3.0	20.3	1.7	1.0	1.0	9	13	55	17
A	11	63	9.2	65.3	1.6	6.4	3.1	20.2	1.7	1.6	1.0	9	12	56	16
A	12	70	8.6	65.1	1.5	6.6	3.0	20.1	2.0	1.5	1.0	9	13	52	18
A	13	70	8.8	65.2	1.8	6.3	3.1	20.2	1.9	1.4	0.7	9	11	57	15
A	14	62	8.9	64.8	1.8	6.0	3.1	19.4	2.0	1.9	1.4	9	11	60	10
A	15	47	7.8	65.2	2.2	5.9	3.0	19.8	1.9	1.4	0.5	9	11	64	8
A	15	47	7.8												
A	16	41	8.1	64.9	1.9	6.8	3.1	20.1	1.7	1.3	1.2	9	12	52	18
B	1	60	6.6	67.1	1.4	5.2	1.5	22.5	1.2	0.9	1.1	5	11	58	20
B	1	60	7.6	66.5	1.4	5.5	1.4	22.6	1.5	1.1	1.5	4	12	49	28
B	2	60	8.1	67.1	1.8	5.4	1.4	22.5	1.4	0.8	1.3	4	9	66	14
B	2	60	6.3	66.7	1.5	5.7	1.4	22.7	1.5	1.0	1.4	4	10	60	19
B	3	60	7.1	66.7	1.2	5.6	1.4	22.8	1.5	1.1	1.2	4	12	49	28
B	3	60	6.8												
B	4	60	8.0	67.3	1.2	5.3	1.4	21.9	1.5	1.3	1.1	4	12	61	17
B	4	63	8.8												
B	5	67	7.2	66.8	1.3	5.7	1.4	22.9	1.4	1.0	1.3	4	13	48	30
B	6	75	7.2	66.9	1.6	5.0	1.4	22.6	1.8	1.3	1.5	4	11	54	24
C	1	150	6.0	63.9	1.4	6.7	3.7	21.4	1.9	1.2	0.1	11	11	42	30
C	1	134	7.1												
C	1	118	7.0												
C	1	123	7.0												
C	1	148	4.9												
C	1	105	5.4												
C	1	148	5.9												
C	1	148	6.6												
C	1	105	6.2												
C	1	128	6.1												
C	1	128	6.5												
C	1	128	6.5												
C_1	1	62	6.6	62.2	4.0	6.2	2.7	21.4	1.6	1.2	0.2	8	12	39	32
C_2	1	200	6.7	63.4	2.8	6.0	3.5	20.1	1.8	2.6	0.6	11	10	52	18
C_2	2	275	7.3	63.9	3.4	4.6	3.2	21.2	1.7	2.2	0.8	10	7	56	18
C_2	3	255	6.9	65.7	2.6	4.2	3.2	21.5	0.4	2.2	1.4	10	6	65	11
C_2	4	216	7.0	62.8	2.6	5.9	3.4	21.4	1.7	2.0	1.5	10	10	38	33
C_2	5	92	6.6	63.6	2.9	6.0	3.3	20.8	1.6	1.6	0.3	10	10	50	22
C_2	5	99	6.8												
C_2	6	124	5.9	65.7	1.8	5.4	3.5	20.2	1.8	2.1	0.6	11	8	65	9
D	1	244	6.1	65.7	0.8	4.6	3.8	21.7	1.4	1.5	0.9	12	6	58	18
D	1	203	6.2												
D	1	253	6.4												
D	1	277	6.0												
D	1	229	6.8												
D	1	229	6.1												
D	2	260	5.4	65.5	0.8	5.0	3.8	21.9	1.8	1.3	1.3	12	7	50	25
D	2	200	5.4												
D	2	193	4.5												
D	2	186	5.3												
D	2	205	5.6												
D	2	258	5.4												
D	2	184	5.6												
D	3	181	5.2	65.2	2.8	3.6	3.3	21.7	1.8	1.5	0.9	10	4	63	15
D	4	(250)	5.1	65.7	1.0	4.5	3.0	22.5	1.8	1.4	1.8	9	7	49	27
D	4	250	5.2	65.4	1.0	4.2	3.5	22.6	1.9	1.2	2.1	11	5	47	29
D	5	(240)	6.8	65.7	0.9	3.9	3.6	22.2	1.9	1.1	1.2	11	4	57	21
D	5	176	6.8												
D	6	139	6.5	65.2	1.1	4.3	3.5	22.5	1.9	1.7	1.1	11	6	50	27
D	6	139	6.5												
D_1	1	107	6.5	63.9	3.5	5.1	2.9	21.9	1.8	1.5	0.4	9	8	49	26
D_2	2	61	7.4	65.0	1.5	5.5	2.8	21.9	1.6	0.9	0.4	8	10	51	24
D_2	3	61	7.5	65.6	1.6	5.9	2.8	21.6	1.9	0.9	0.3	8	11	53	22
D_2	4	61	7.3	65.3	1.7	6.1	2.7	22.0	1.9	0.8	0.5	8	12	45	28
D_2	4	55	7.2												
D_2	4	55	7.3												
E	1	35	11.7	66.8	1.8	7.3	3.1	17.5	2.3	1.7	4.8	9	14	60	5
F	1	36	9.4	64.7	2.3	7.1	1.7	20.9	1.2	2.4	0.5	5	16	49	23
F	1	36	9.8												
F	1	36	9.3												
F	1	36	9.7												
F	1	36	9.6												
F	1	36	9.6												
F	2	40	7.5	64.9	2.0	6.7	1.7	20.6	1.8	1.8	0.3	5	15	53	18
F	3	31	8.6	65.0	2.8	6.4	2.0	21.1	1.8	1.1	0.4	6	14	52	21
G	1	187	3.2	64.7	0.9	4.2	0.4	23.5	1.9	3.6	1.5	1	10	44	34
H	1	58	8.8	63.4	3.1	6.5	3.2	20.4	1.8	1.4	0.7	10	12	47	23
H	1	58	9.5												
H	2	58	9.6	63.7	3.1	6.5	3.2	20.3	1.9	1.4	0.8	10	12	48	22
H	2	58	9.6												
H	3	58	9.3	63.6	3.1	6.4	3.2	20.3	1.8	1.4	0.6	10	11	50	21
H	3	58	8.5												
H	4	58	9.3	63.7	3.2	6.0	3.2	20.3	1.6	1.6	1.1	10	10	51	20
H	4	58	9.0												
H	5	57	8.7	63.6	3.1	5.9	3.3	20.2	1.9	1.6	1.6	10	10	49	21
H	6	58	8.2	63.8	3.9	5.8	2.8	20.5	1.8	1.5	1.5	8	11	50	21
H	7	62	9.3	63.2	3.9	5.7	2.8	20.3	1.8	2.2	1.2	8	10	51	20
H	8	62	9.0	63.7	4.0	6.0	2.9	19.8	1.9	1.9	2.1	9	11	50	19
I	1	54	8.0	64.4	2.6	6.0	2.3	21.4	1.8	1.0	0.8	7	12	47	26
I	1	60	7.4												
I	1	84	6.3												
I	2	49	7.6	64.0	3.8	5.5	2.4	21.2	1.9	1.1	0.8	7	11	50	23
I	2	49	8.4												
I	2	49	8.0												
I	3	63	6.7	63.0	4.5	5.6	2.8	20.7	1.9	1.2	0.6	8	10	50	22
I	3	53	6.9	62.6	4.6	6.2	1.8	20.9	2.2	1.3	0.5	6	13	44	27
I	3	57	6.9												
I	4	58	7.3	62.4	5.4	5.5	2.3	21.9	1.7	0.9	2.1	7	11	34	37
I	4	48	7.3												
I	5	51	8.6	62.2	3.5	6.9	2.4	20.6	1.9	1.9	0.5	7	14	39	30
J	1	49	7.7	63.3	3.7	6.9	2.5	19.9	2.0	1.5	0.6	8	14	48	21
J_1	2	(290)	5.3	64.1	2.0	4.7	3.7	23.2	1.8	0.8	0.7	11	6	40	34
K	1	90	6.6	63.5	2.8	6.7	3.7	20.8	2.4	0.6	0.1	11	11	43	27
L	1	92	7.0	62.9	2.9	6.2	2.7	20.4	1.9	2.6	1.2	8	12	45	25
M	1	77	6.3	64.0	4.9	4.6	2.2	21.3	1.7	1.2	0.5	7	8	60	16
M_1	1	138	6.5	64.5	1.3	7.4	2.7	20.1	1.6	1.2	0.1	8	15	51	19
N	1	62	7.8	63.3	2.9	6.0	2.8	20.8	2.0	1.6	1.0	8	11	46	25
N_1	2	153	7.3	63.9	2.4	5.4	3.4	20.4	1.7	2.3	0.6	10	9	57	16
N_1	2	100	7.2												
O	1	62	7.7	63.6	2.3	5.9	3.7	20.9	1.8	1.3	0.5	11	9	48	24
O	1	62	8.2												
O	2	62	9.0	63.1	2.4	6.5	3.3	21.2	2.0	1.2	0.5	10	12	40	31
O	2	62	9.0												
O	3	62	7.1	63.0	2.2	6.6	3.3	21.1	2.1	1.3	0.5	10	12	39	31
O	4	62	8.1	63.4	2.2	6.6	3.2	20.8	1.9	1.7	0.3	10	12	44	26
P	1	72	8.7	65.4	1.6	5.2	3.0	21.1	1.6	1.6	0.7	9	9	60	15
Q	1	60	7.6	62.9	4.0	5.9	2.5	19.7	1.9	2.1	1.3	8	14	53	17
R	1	78	8.4	64.4	1.8	6.1	3.9	21.1	1.6	0.8	1.6	12	10	45	27
S	1	46	5.3	62.3	4.5	6.0	0.5	23.3	1.9	2.4	0.9	2	15	26	47
S	2	63	5.7	62.6	3.9	6.5	0.5	21.9	1.7	3.3	1.5	2	17	33	38
S	3	31	7.8	63.6	4.2	6.9	0.6	20.7	1.7	2.3	0.8	2	17	47	24
T	1	72	6.7	64.7	2.1	4.5	2.2	24.1	1.4	1.4	1.1	8	8	40	40
U	1	44	7.4	63.3	4.0	5.2	2.6	20.5	1.8	1.3	2.1	8	9	49	22
V	1	93	6.3	64.9	1.6	6.5	4.4	20.1	1.8	1.0	0.2	13	10	56	15
V	1	80	6.3												
W	1	150	5.3	65.1	1.7	5.3	2.8	21.2	1.6	2.2	1.9	8	9	52	21
X	1	(180)	1.0	46.8	2.2	8.0	2.7	31.6	2.3	3.0	0.6	..	..	..	..

NOTES: 1. Parentheses in third column indicate that test has not been finished.

2. C, C_1 and C_2 are samples of same brand made at different mills. The same system of notation applies to brands D, J, M and N.

3. E—a high-early-strength portland cement.

4. G and S are two different brands of white cement.

5. X is a sample of cement of the "eisen-portland" type—that is, a ground mixture of blast-furnace slag and portland clinker. It contains more slag than would be permitted for this type of cement by either German or British standard specifications.

6. $C_4AF = 4CaO.Al_2O_3.Fe_2O_3$; $C_3A = 3CaO.Al_2O_3$; $C_3S = 3CaO.SiO_2$; and $C_2S = 2CaO.SiO_2$

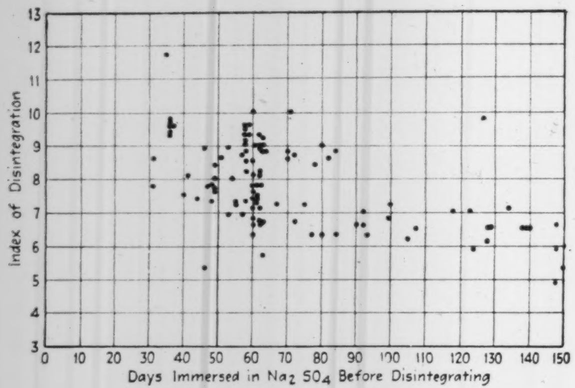


Fig. 1—Sodium sulphate resistance of cements plotted against Merriman index of disintegration

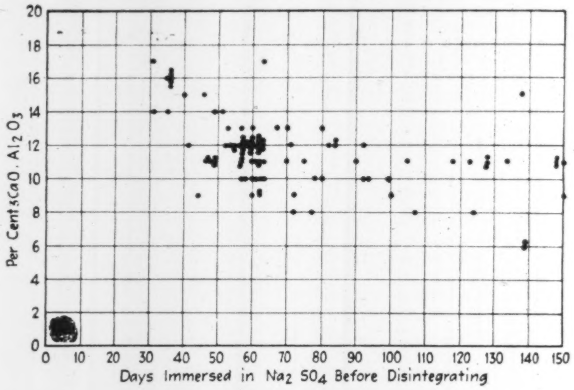


Fig. 2—Sodium sulphate resistance plotted against tricalcium aluminate

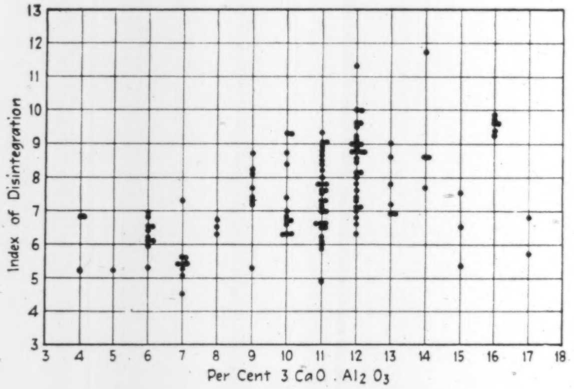


Fig. 3—Tricalcium aluminate plotted against index of disintegration

or two it will clear up entirely. It can readily be seen that if the acid is added rapidly it is very easy to overrun the end-point. Heating accelerates the action.

It is probable also that the rate of solution of the cement is affected to some extent by such factors as temperature and time of shaking. It should be realized that this titration is purely empirical and lacks precision unless performed in exactly the same way each time it is carried out. Two investigators were unable to check one another consistently within 0.5 ml.

Further, it is impossible to obtain any quantitative expression for the extent of disintegration of the briquets that might be correlated with the indices and the analytical results. The condition of the briquets can be estimated only roughly. It is difficult for any one person to state just when the specimens have reached the same stage of disintegration, and it is practically impossible for two different persons to check each other.

A number of other graphs, not reproduced here, only further emphasize such relations as are seen to exist in Figs. 1 to 3. All clearly show, as Merriman states, that using these methods, "Cements differ both from brand to brand as well as from time to time within a particular brand." (Brand *D* of this paper was produced by the same mill as brand 2 of Merriman's paper; the index for *D* ranged from 4.5 to 6.8; Merriman obtained a value of 1.3. Brand *J* was produced by the same mill as 31 of Merriman; the index of *J* was 5.3; of 31 it was 3.1.) The same thing is true of the results of usual methods of testing, such as time of set, fineness, consistency, strength, etc. This is clearly shown in the complete data of committee C-1 of the American Society for Testing Materials to which Merriman refers.

Meaning of Index Doubtful—It would seem to be doubtful if this index is indicative "of the completeness with which a cement has been manufactured." If the content of free lime in the cement is indicative of completeness of manufacture—and it would seem that until all the lime has become fixed as a silicate or aluminate the cement has not been completely burned—then the index is not such a measure. The greatest amount of free lime in any cement was found to be 4.8 per cent. The index of this cement was 11.7, and the briquets were removed in 35 days from the sulphate solution. There were five cements with a free lime content of 2.1 (the next lower amount of free lime noted). Their indices ranged from 5.2 to 9.0, and one of these withstood the sulphate solution 250 days, the other four having been removed at 44 to 62 days. Forty-three cements had a free lime content of between 1.0 and 2.0 per cent. Their indices ranged from 3.2 to 9.3, and the days of resistance to the solution ranged from 41 to 260.

Correlation With Field Experience Lacking—But this study as well as Merriman's fails to correlate the index or the disintegration of the briquets with actual durability or lack of durability of concrete in the field made from the cements in question. This, of course, is due to the fact that lack of durability seldom manifests itself under any service condition in less than three to five years, and such a time has not elapsed since the promulgation of this accelerated test method.

Essentially, therefore, the method has not yet been proved an adequate accelerated test for predicting the durability of a cement in field concrete either under favorable or adverse conditions. Most of the cements used in both studies were produced by old established mills, the products of which have undoubtedly in a great majority of cases given most adequate service, though also no doubt instances of less satisfactory results can be found. In the present case all the cements are being used on various government projects where conditions range from the best to the most severe. Should anyone five or ten years hence—when lack of durability would surely manifest itself, if it ever does—be interested in correlating the suggested laboratory method with actual field conditions, complete data would be available. Such possible later correlation of durability in structures with available test data was one of the principal reasons for this present study.

E. P. Flint and W. F. Clarke, of the Bureau of Standards, assisted in some of the experimental work involved in this study.

Central American City Improves Sewers and Paving

By R. C. HARDMAN
Fort Myers, Fla.

Puerto Limon converts combined to separate sewer system—Paving troubles—Heavy rainfall records

UNUSUAL construction features necessitated by foundation conditions, poor drainage and excessive rainfall were included in paving and other municipal work recently completed at a cost of $800,000 at Puerto Limon, Costa Rica. This city of 12,000 population, about 180 miles west of the Panama Canal, is laid out in blocks 300 ft. square, with 50-ft. streets, the greater part being over a swamp. Some 30 or 40 years ago the swamp was filled, the streets were graded and surfaced with coral, and sewers and water supply were installed. Rain during 1928 and 1929 averaged 18½ days per month, with a rainfall of nearly 12 in. per month (Fig. 1).

Original Conditions—For stormwater and sewage there were box sewers in general about 2½x3ft. with heavy sides and top of plain concrete, while the bottoms were of large blocks of coral surfaced with cement. Their general arrangement is shown in Figs. 2 and 3. Stormwater had access through catch basins 12x12 in., with 6- and 8-in. connections fitted usually with some sort of trap. As the sewage flow is slight and over a flat rough bottom the traps did not prevent the escape of obnoxious odors or of thousands of cockroaches, and a tropical cockroach 2 in. long is considered small. Sewage from cross-streets was collected in 6-in. clay-pipe laterals having automatic flush tanks at dead ends and in the middle of blocks where the grades were flat. But the flush tanks had been long out of service, so that many of the laterals were completely clogged and property owners had built private sewers discharging into the box sewers at the most convenient places. House connections were usually at or close to the surface, so that clean-out openings and broken pipes in the yards, as well as untrapped fixtures, were often used for the disposal of rubbish, tin cans and old clothing, causing frequent stoppage.

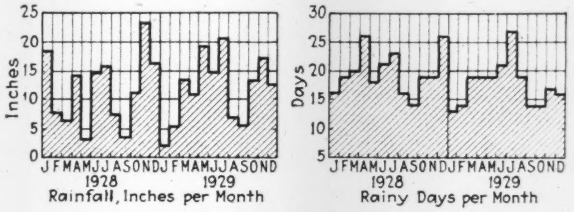


Fig. 1—Rainfall at Puerto Limon

While the box sewers were of ample capacity, the inlets were too small and their gratings were quickly choked by street rubbish piled over them by the first rush of stormwater, so that with water knee deep in the streets there was only 6 to 8 in. of water in the sewers until the sanitary squad removed the inlet gratings. Some of the flooding was due to a creek carried through the filled ground by two parallel box sewers of ample capacity but with inadequate inlets (Fig. 2). Diversion of this creek was ordered, although the new improved inlets would have made this unnecessary.

The streets were in terrible condition, surfaced with coral and given originally a very high crown, but they had been worn down so that the tops of the box sewers were usually exposed. As the gutters were higher than the street surface, water was removed from the streets only by evaporation and percolation. Water supply was from the Banano River, but with pressure so low that it did not serve the second story of buildings.

Improvement Contract—In 1928 a contract for improving the conditions was awarded by a commission headed by Don Juan Ranagosa, governor of the province, and composed of two Americans, two Costa Ricans and one British member. This contract provided for surfacing the streets with 2-in. sheet asphalt on a coral base, building new sewers and extending the water intake 5 miles upstream to secure more head. The only plans furnished were old street profiles and tentative sewer grades. Upon the engagement of the writer the type of paving was changed to penetration asphalt.

Reconstruction of Sewers—The box sewers were retained to carry stormwater, all sanitary sewer connections being cut off and plugged. Catchbasins of suitable size, Fig. 4, were built with 12- or 15-in. connections, but it was sometimes difficult to get sufficient cover even for the 12-in. pipe. At corners having flow in one direction only both gratings were placed on one side, the shape of the box being altered accordingly. All gratings were 18x24 in., of the slotted type and having the longer dimension parallel with the flow. Curb inlets, 24x5 in., were also necessary on account of the street rubbish. With these changes rainwater was carried away without any ponding.

Revamping of the sanitary sewers is indicated in Fig. 2, which shows one of the many short systems. This work consisted essentially of installing a double line of sewers in all streets containing a central stormwater box

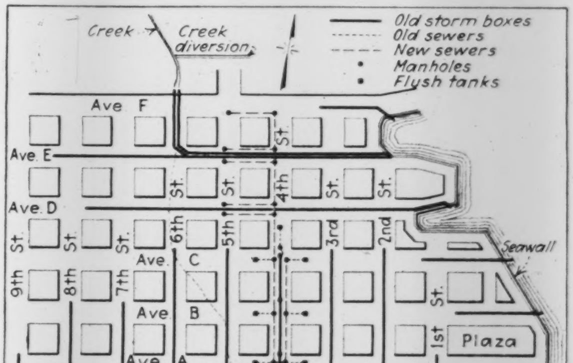


Fig. 2—Sewer system of Puerto Limon
New sewers on Fourth St. and intersecting streets represent typical arrangement of sanitary sewers.

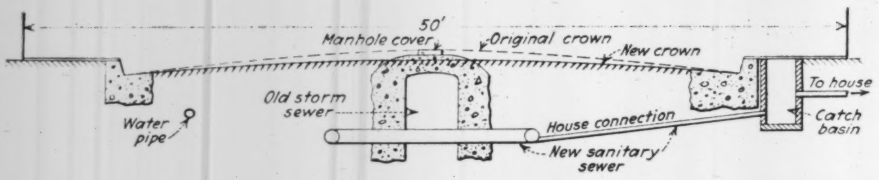


Fig. 3—Street section, showing sewers

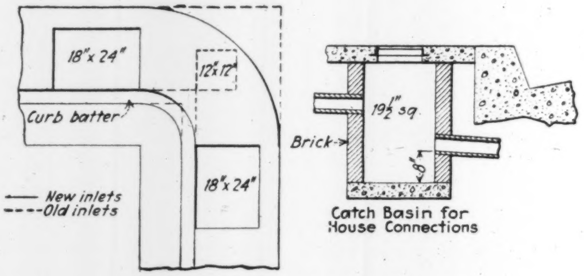


Fig. 4—Sewer inlets and catchbasins

sewer. These lines were connected at Ave. A by passing one line under the box, a feat made possible by the fortunate fact that from Ave. A to the sea wall the box sewers had a much steeper grade. At the sea wall the sanitary sewer was connected directly to the box sewer. This system resulted in an excessive number of manholes. All flush tanks were overhauled and placed in service, and clogged sewers were cleaned or relaid.

The main difficulty with the sanitary sewers was in securing adequate grades. In few instances could grades of more than 0.005 be obtained, and in many cases grades as flat as 0.003 were necessary. Crossing of the large box sewers in some cases was made by the use of inverted siphons. To prevent clogging of the sewers by shoes and tin cans, each house connection was provided with a small catchbasin (Fig. 4) immediately inside the curb and fitted with a cast-iron cover sealed with asphalt and oakum, so that it could be easily inspected and cleaned. Catchbasins on house connections were made essential by the habits of the inhabitants.

Street Work—As is usual in Central American cities, especially the older ones, no complete plans or grades for underground structures can be made in advance, as no record of previous structures exists. Consequently the first step is the exploration work for an underground survey. The usual method is to dig trenches in both directions across each street intersection and at other control points. Tentative lines and grades can then be placed on paper, but very often uniform grades do not exist between intersections. The only method is to make plans as construction proceeds. Aside from difficulties occasioned by such conditions, no serious problems arose. Construction difficulties were produced by the soft ground, heavy rainfall, trucking away excavated material and cutting a trench through two 8-ft. hardwood stumps and a dump of railroad-car wheels and axles.

With the laying of the paving the real trouble began. As the old crust was worn down in most places and had to be further reduced for the new paving base, which was graded to a much flatter cross-section, not much crust was left. The new crown was ½ in. to the foot, to save as much of the crust as possible and also to obviate the necessity of cutting away too much of the tops of the box sewers, which were all too high. Fortunately the tops were 12 to 15 in. thick and of exceptionally good concrete, so that the necessary cutting still left them able to carry a 12-ton roller with safety.

The eastern portion of the city gave no difficulty, as the subsoil was of a superior quality; but in the western part and especially along the course of the old stream the roller developed waves that increased with the rolling. Efforts were made to consolidate the subsoil with the coral removed from the streets, but without success. As a last resort the material from all soft spots was removed to a depth of 4 or 5 ft. and trucked outside the city. Then railroad ties or newly cut timbers were placed and covered with stable material and coral in 12-in. layers thoroughly rolled between showers.

This soft material occurred in irregular shaped patches of varying sizes, from a few square yards in area to the full width of the street. From one-third to one-half the street area in the western portion of the city was corduroyed. Even in the higher ground, after the base had been thoroughly rolled and the macadam base course had been placed, the street had to be reopened and corduroyed in a few places. In one case, after the final penetration course had been placed, soft spots developed the entire length of a block. As this particular block led to the crusher, it was decided to see what would develop under the heavy traffic of 2½-ton trucks loaded with rock, but in about ten days all traces of soft spots disappeared.

The principal trouble was with the rain, which fell so often that no opportunity was given for any drying out. The penetration work also was delayed by the same cause, but this was not serious, as the paving was paced by the underground work. Some 10,000 to 12,000 sq.yd. per month was placed under favorable conditions.

Personnel—One of the interesting features of the job was its cosmopolitan character. The contract was awarded to R. W. Hebard & Co., Inc., New York, with L. H. Walker in charge as general manager. Under him were a German office manager, a Danish chief timekeeper and cost accountant, an Italian general superintendent, a Danish superintendent in charge of waterworks, a West Indian negro as paving superintendent and an American mechanic. The laborers were mostly West Indian negroes, with some Nicaraguans, Costa Ricans and Italians. Cement was from Norway, sewer pipe from Belgium and the United States, steel from Germany and the rest of the material from the United States. The writer served as chief engineer for the Junto de Saneamiento (board of sanitation), with A. S. Rees in charge of office and accounting.

◆

New Ore Dock on Lake Superior

A reinforced-concrete ore dock, 968 ft. long, having 150 pockets with total storage capacity of 47,250 tons, is to be built at Marquette, Mich., for the Duluth, South Shore & Atlantic Ry. to the designs of E. A. Whitman, chief engineer. The contractor is the Merritt, Chapman & Whitney Corp., Duluth, Minn., and the structure is to be completed in time for the 1932 ore-shipping business. It will cost about $1,500,000, including the steel and timber approach.

Pipe-Line Corrosion and Soil Conductivity

SURVEYS of corrosion, electric current and soil conditions on nine pipe lines in Texas, Oklahoma and Kansas, recently carried out, have led the Bureau of Standards to conclude that there is a definite correlation between pipe corrosion and soil resistivity and that where the soil conductivity is high, corrosion occurs.

Electric currents of considerable strength, up to several amperes, were found flowing in all the pipe lines, and it was concluded that these currents were mainly of galvanic origin. Near electric railway lines some effect of current was detectable. At tank farms and pumping stations the currents were directly inward, toward the tanks, a phenomenon not yet explained. Elsewhere along the pipe the current flowed from regions of most resistive to regions of most conductive soil.

In each of the several pipe lines surveyed, current was found to flow in different directions at different points along their length, and in general the current strength varied continuously from point to point along the line, indicating accession and loss of current. Where current left the pipe, corrosion was found. In most instances a record of previous leaks was available as confirmation; in some other cases the pipe was exposed for reconditioning or repair, and the observed corrosion checked the expectations.

Soil resistivity was measured along the pipe lines, and all stretches in which the soil was abnormally conductive were found to be regions of corrosion trouble and generally of current departure. In most instances the trouble zones had soil resistivities below 500 or 600 ohms per cubic centimeter, and where higher resistivities were found there was no marked corrosion trouble. At a few points salt impregnation from well overflow appeared to be responsible for both the corrosion and the high conductivity.

A method of measuring soil resistivity worked out for use in these surveys is recommended by the bureau for general use in practice. The necessary equipment consists of two oak rods tipped with iron, one carrying a small flashlight battery and the other a milliammeter. The tip of the anode rod is an iron cone of $\frac{1}{2}$-in. base and $\frac{1}{4}$-in. height. The cathode rod has a conical tip of $\frac{3}{4}$-in. base diameter, $2\frac{5}{8}$-in. length and $\frac{1}{8}$-in. hemispherical point. The anode rod has a two-cell dry battery fastened near its upper end, the positive pole of which is connected through a switch to the rod tip. The other rod carries near its upper end a milliammeter having ranges of 25 and 100 milliamperes, the latter for low resistivities.

With this equipment, if the rods are pushed into the ground so that their tips are separated 8 in. or more, the resistivity of the soil will be indicated with an accuracy of about 6 per cent; the result is independent of the distance between the rods so long as this is not less than 8 in. The apparatus should be calibrated against material of known resistivity, such as sodium chloride solutions; the calibration constant will be about 3—that is, the soil resistivity in ohm-centimeters is numerically equal to three times the measured resistance between the electrodes.

Tests should not be made in dry soil but only in damp or wet soil. They should be made at pipe level, and in extreme cases at intervals of 100 ft. or less along a proposed location to assure discovery of all "hot spots."

For the purpose of measuring current in pipe lines the potential-drop method is used, but care must be taken to obtain good electrical contact with the pipe. In the case of buried pipe a bar may be driven to the top of the pipe, and in the hole thus formed a hardened-point steel rod or drill is inserted; by turning or tapping the drill good contact can be obtained. A low-resistance millivoltmeter with full-scale range of one millivolt is suitable. The test length should be 50 to 100 ft., unless the current is so large that a smaller test length must be used to remain within the meter range. The weight of the pipe and its material (resistivity) must of course be known, and abnormal resistance at joints must be detected and allowed for.

Wind Pressure on a Mill Building

Tests on a 2x4-ft. model in the 10-ft. wind tunnel of the Bureau of Standards shows moderate positive pressures and high suctions

MODEL wind-pressure tests recently made at the Bureau of Standards on a mill building show irregular pressure distributions, moderate pressures and surprisingly large suctions. (H. L. Dryden and G. C. Hill, April, 1931, issue of the bureau's *Journal of Research.*) Results are shown by pressure-contour maps.

The model, Fig. 1, of $\frac{1}{4}$-in. aluminum plate, was 2x4 ft. in plan, 6 in. high to the eave, with 20-deg. roof pitch, and had a removable monitor, 6 in. wide, 30 in. long and 1.6 in. high. Several hundred 1/25-in. holes in the different faces provided for hose connections to pressure gages. This building model was mounted on a platform 10 ft. wide and 15 ft. long, placed on the horizontal diameter of a 10-ft. wind tunnel.

Tests were run at wind speeds of 47, 60 and 80 ft. per second (32, 41 and 55 miles per hour). In all cases the ratio of measured pressure to velocity-head pressure ($0.00256V^2$ for velocities in miles per hour, and pressures in lb. per sq.ft.) was closely the same for the three velocities. All results were therefore expressed in the ratio of measured pressure to velocity pressure. The building was tested crossways of the tunnel (wind against side), lengthways (wind against end), and in the intermediate 45-deg. position (wind against corner).

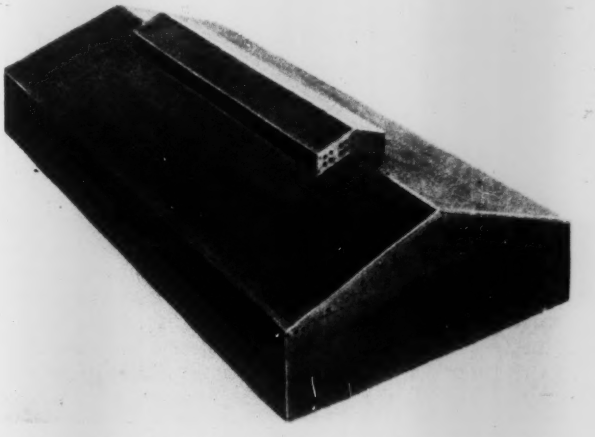


Fig. 1—On the 2x4-ft. aluminum model, pressures were measured at many points on the different faces by gages connected to small holes in plugs (dark spots) inserted in the $\frac{1}{4}$-in. plate of the model.

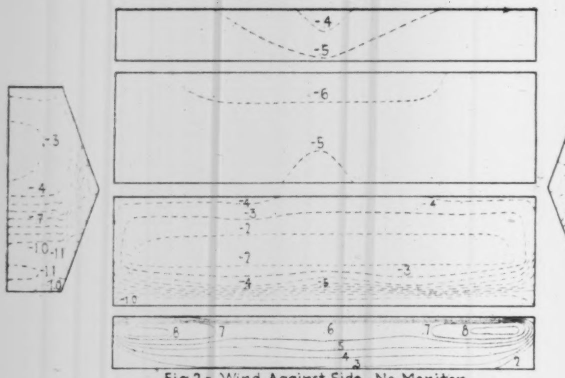


Fig. 2 - Wind Against Side, No Monitor

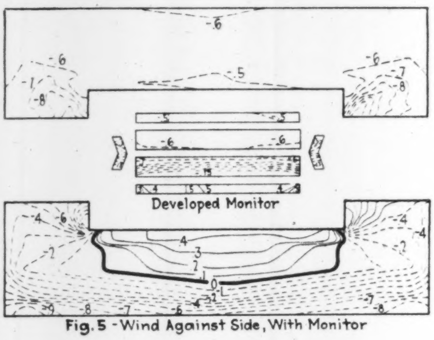


Fig. 5 - Wind Against Side, With Monitor

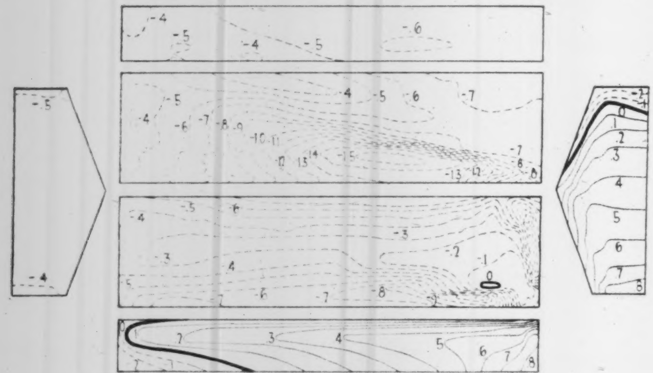


Fig. 3 - Wind Against Corner, No Monitor

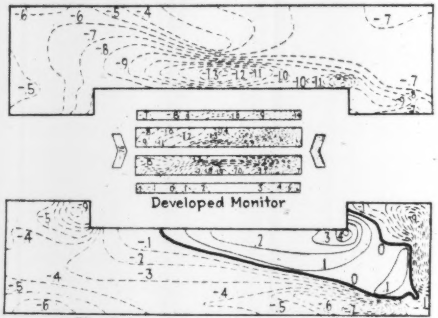


Fig. 6 - Wind Against Corner, With Monitor

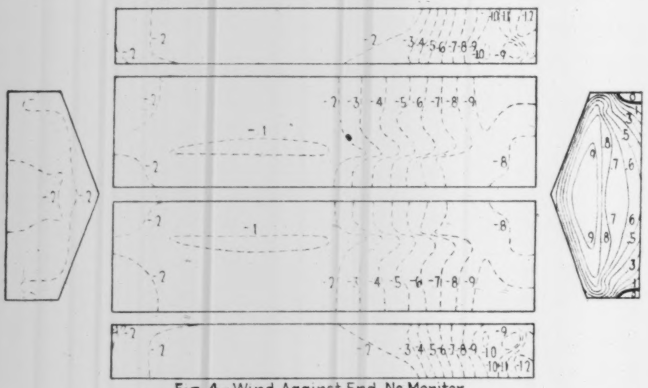


Fig. 4 - Wind Against End, No Monitor

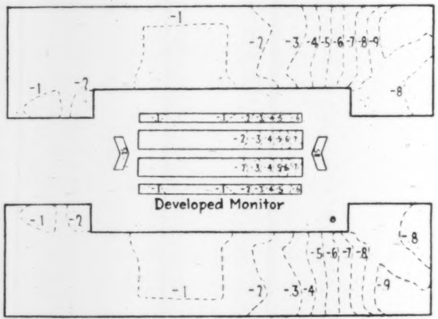


Fig. 7 - Wind Against End, With Monitor

Figs. 2-7—Pressures measured in the tests were converted into contours of equal pressure on the several faces of the building. The numbers appearing on the contours represent fractions of theoretical velocity pressure ($0.00256V^2$, where V is in miles per hour and pressures are in lb. per sq.ft.). The ratios computed from the three wind velocities agreed closely.

End and side elevations of building are omitted in Figs. 5, 6 and 7, since no readings were recorded on these faces.

As will be seen from Figs. 2 to 7, the positive pressures at no time reached full velocity pressure; the highest ratios are 0.8 and 0.9, attained on small parts of the windward faces. Much larger suction values were reached on lateral faces as well as on the roof (but not on the leeward face), and in the case of endwise wind even the windward face of the monitor showed a large suction pressure, the air current apparently being deflected up over the monitor by the gable of the building. The extreme suctions occurred on the monitor roof with wind against the corner, there being measured suctions as high as 3.3 on the leeward roof slope of the monitor.

From these results it can be seen that, if wind action on a large structure is similar to that on the wind-tunnel model, large outward pressures may occur on walls and roof, especially when openings facing the wind transmit positive pressure to the interior.

Dryden and Hill computed from their results the total pressure on the building in the transverse, longitudinal and vertical directions (the latter pressure representing uplift). These pressures, expressed as average pressure ratios in the respective directions, are as follows:

	Without Monitor			With Monitor		
Wind on:	Side	Corner	End	Side	Corner	End
Transverse force....	0.664	0.587	.....	0.894	0.651	.....
Longitudinal force...	.....	0.821	0.820	.....	0.811	0.755
Lifting force.......	0.472	0.608	0.381	0.472	0.608	0.326

Dock Elevators Serve Double-Deck Boats of Automobile Ferry

Michigan highway department provides special facilities for congested tourist traffic at Mackinac Straits

SO MANY highway tourist routes include the crossing of the Straits of Mackinac, at the head of Lake Michigan, that the handling of the heavy automobile traffic between Mackinaw City and St. Ignace, Mich., during the summer has become a serious problem, and special measures are being taken by the Michigan state highway department to improve the facilities and service at this point.

In 1923 the department opened a steam-ferry service, as described in *Engineering News-Record*, Oct. 6, 1927, p. 554, and has now three screw steamers in operation, each carrying 75 to 90 cars. They are about 200 to 212 ft. long and have a 45- to 48-ft. beam, with a loaded draft of 10 ft. There are two gangways on each side, and one of the boats has an elevator to enable cars to be stowed on the forward part of the upper deck, while the others are now equipped for loading cars on the upper deck by means of dock elevators. At St. Ignace there is a timber wharf with berthing space for one steamer. At Mackinaw City a rockfill pier extending 1,500 ft. from shore has a concrete end with berthing space for a steamer on each side, although in practice only the north side is used. The trip of 10 miles is made in about 60 min., but at times there is a great accumulation of cars awaiting their turn.

Traffic has continued to increase rapidly, and during the season of 1929 the ferry service accommodated 128,604 cars and trucks and 222,821 passengers, including pedestrians as well as those occupying the vehicles. The total revenue was about $392,380, while the expenditures, including operation and maintenance, amounted to $165,516. A great majority of the traffic consists of automobiles, of every kind and class. During the winter this service is discontinued owing to the limited traffic and the severe ice conditions in the straits, but the few automobiles or trucks are then handled by the larger railroad car-ferry steamers, which are built as icebreakers and are in service throughout the entire year. However, the highway department is considering the purchase of an ice-breaker steamer, in order to maintain its own service without depending on the railway car-ferry boats.

While the deck elevator and double-deck arrangement has increased the carrying capacity, it causes considerable delay in loading and unloading, owing to the necessarily slow process of handling each upper-deck car twice on the elevator. To overcome this difficulty and increase the traffic capacity, additional berthing space is being provided and will be equipped with elevators, so that cars can be handled to and from the upper deck without interfering with those on the main deck. Each elevator will carry two cars. These new facilities are designed to accommodate ferry steamers 250 ft. long with 60-ft. beam.

At Mackinaw City, Mich., a triangular pier head is being built as an extension of the present pier, giving three berths; but the north berth of the old pier will be retained also for storing one boat that may be out of commission temporarily. This construction is shown in Fig. 1. The main part of the pier is rockfill with heavy riprap on the slopes and carrying a 20-ft. concrete roadway and a 4-ft. sidewalk. For 220 ft. at the outer end, however, where the steamers are berthed, it consists of two lines of timber cribs surmounted by concrete dock

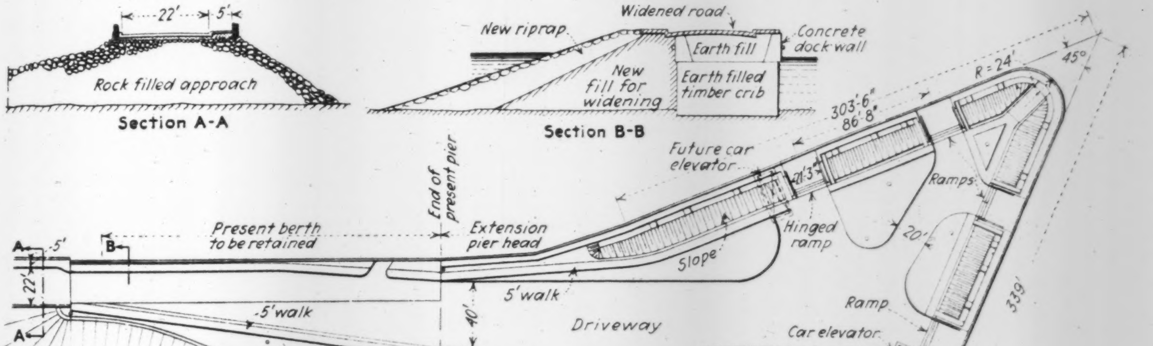

22'
5'
Rock filled approach
Section A-A
Widened road
New riprap
Concrete dock wall
Earth fill
New fill for widening
Earth filled timber crib
Section B-B
R = 24'
45°
303'-6"
86'-8"
Future car elevator
21'3"
Ramps
End of present pier
Present berth to be retained
Extension pier head
Hinged ramp
20'
A
5'
B
22'
Slope
5' walk
5' walk
40'
Driveway
Ramp
Car elevator
339'
220'
22°30'
Ramp
Ramp
B
Toe of fill
Protection crib
284'
R = 24'

Fig. 1—Pier head with elevators for automobiles

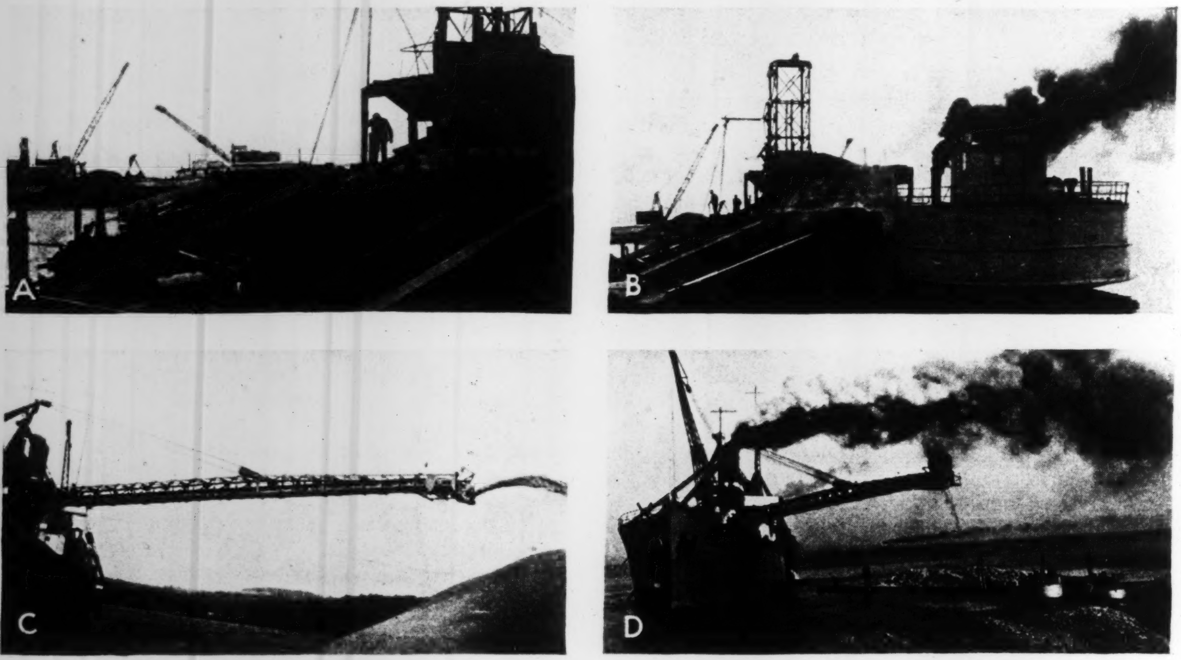


Fig. 2—Pier construction in winter at Mackinaw City, Mich.

A: Concreting a crib. Material-handling plant is in background. *B:* floating concreting plant, concrete under canvas being cured with steam. *C:* steamer with conveyor boom placing stone filling in cribs. *D:* steamer delivering sand with stacker on end of boom.

walls, with earthfilling to support the paved roadway. The extension or pier head, with sides approximately 300 ft. long, is formed by an outer line of timber cribs 24 ft. wide, 16 ft. high and 56 to 100 ft. long. Upon this will be a timber superstructure of channel section, in which the concrete dock wall will be built. The outside vertical timber face will remain as a fender, being arranged to permit its removal and renewal when worn or damaged, but the inner face or back wall is to exclude water and will be removed when the wall is completed, the inclosed space between cribs and walls being then filled and paved. The depth of water is about 20 ft., with a thin cover of mud and soft material over hard bedrock. The cribs, sunk by loading ballast pockets, are seated on a 12-in. bed of broken stone in a dredged trench, as shown in Fig. 4. Details of the crib and dock wall construction are given in Fig. 3.

At each berth there will be two gangways corresponding to those in the ship's side, and each of these will have a hinged gangplank or ramp 20x21 ft. in order to provide adjustment for a maximum difference of 4 ft. between the elevation of pier and deck. These ramps are structural-steel frames with floor paving of welded steel plates. They will weigh 20 tons and have 10-ton concrete counterweights below the level of the deck wall. These weights will move in 34-in. watertight steel tubes 19 ft. long, extending about 10 ft. below the water line. Each ramp is motor-operated by means of cables, but is supported in operating position by adjustable electrically operated levers and locking dogs, so that no live load is carried by the cables. The speed of travel of the outboard end is about 20 ft. per minute.

As the east face of the dock will be most generally used, this is the first to have an elevator, which will be located adjacent to the forward ramp, as cars are stowed only on the forward side of the upper deck. This will be an electrically operated 5-ton elevator with platform 10x30 ft. for two cars and with a lift of 12 ft. at the speed of 45 ft. per minute. The gates on the dock and ship side of the elevator are electrically controlled, and the upper or deck gate is interlocked with the apron or gangplank, which is hinged to the elevator platform and lowered to connect with the ship's deck. A second elevator will be provided later on the north side, which is the most protected, so that cars can be handled to and from a ship in stormy weather. Both these elevators will be inclosed in ornamental towers of reinforced concrete.

To prevent a steamer on the south side from running into the rockfill beyond the berth, there will be a timber fender crib 30 ft. square and 27 ft. high, as shown. For the manufacture of these cribs special machines were devised to plane, mortise and dovetail the 12x12-in. timbers, so that they are put together easily and rapidly and make a close or tight face, as described in *Engineering News-Record*, Jan. 8, 1931, p. 79. In the curved and diagonal faces of the cribs special shapes of dovetails and mortises had to be cut.

Construction Work—On account of the exposed position of the pier the contractor established his crib building yard at St. Ignace, on the other side of the Straits. A light standard-gage locomotive crane with 50-ft. boom piled the timbers and also delivered them to two roller-bearing conveyors or feed tables 300 ft. long, serving the woodworking machines. The cutoff saw and planer were on the first line and the dovetailer and gaining machine on the second line, the machines being set back to back. After being cut to length and planed, the timbers were shifted to the second line to be dovetailed and gained and were then either piled or placed in the cribs by another crane with a 50-ft. boom. Holes were bored by pneumatic or electric tools, and bolts were driven by pneumatic hammers. All machines were electrically operated by means of a 90-kw. diesel-electric unit, except

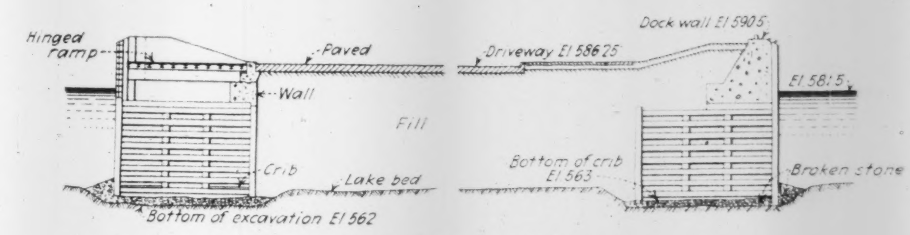


Fig. 4—Section of pier head

that the air compressor was driven by steam from a boiler fired with sawdust and shavings.

Tough hardpan at the Mackinaw City pier was dredged to 18 ft. below water. A bed of gravel was then deposited from a scow, leveled with clamshell buckets and rammed with a 5-ton concrete tamper 6 ft. square cast on a 12x12-in. timber 20 ft. long. The cribs were towed into place and sunk with stone in loading pockets, but it was a difficult job to get them sunk exactly in place. When finally placed the floor timbers were laid under water and all seams and joints were calked, so that the forms could be pumped out and concrete poured in the dry. The concreting plant (Fig. 2) was an old steamer hull equipped with 100-yd. hoppers, weighing batchers, mixers, steel hoisting tower and chutes. Curing was done by steam, the concrete being inclosed with canvas. Material was delivered to the concreting plant by a scow 30x90 ft. with a steam crane and a 1-yd. bucket. A similar scow with crane handled the foundation mat. Dredging was done from a barge with a crane and 2-yd. bucket and by a steamer. Aggregate and stone filling was delivered by the steamer "Fred W. Green," which is equipped with two cranes and a conveyor on a long boom. A revolving stacker on the end of the boom enables material to be thrown 35 to 50 ft. beyond the conveyor.

This interesting development for the special benefit of automobile tourist traffic has been designed under the direction of Grover C. Dillman, state highway commissioner of Michigan; Clifford E. Foster, chief engineer; and C. A. Melick, bridge engineer. The Lyons Construction Co., Grand Rapids, Mich., has the contract for the Mackinaw City dock, except that the paving and lighting will be let separately, while the Otis Elevator Co. will supply the elevator equipment. This dock is to be completed in the spring of 1931 at a total cost of about $360,000. At St. Ignace there will be a short pier with triangular head similar to that already described. As its location is about a mile downstream from the present wharf and is more easily accessible, it is probable that the schedule time of the trip will be reduced about fifteen minutes. It is expected that the contract for the construction of this pier will be let early next spring.

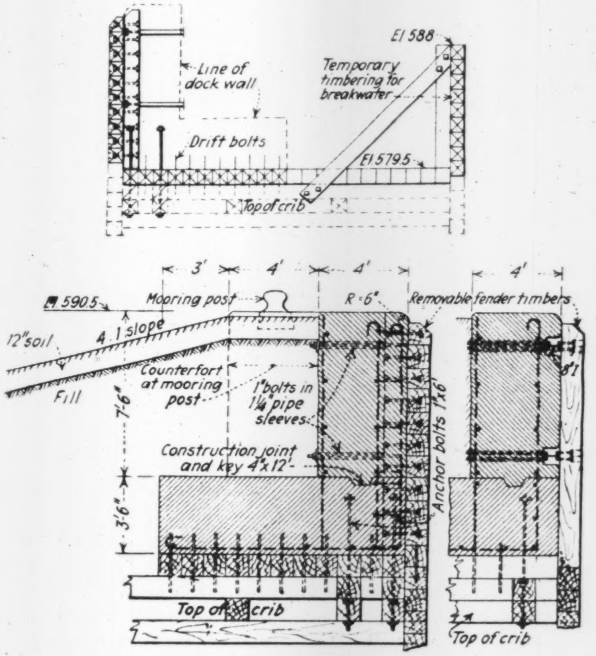


Fig. 3—Dock wall and crib superstructure

Left: typical dock wall with horizontal fender timbers. Right: vertical fender timbers on curves. Top: timber superstructure; part in rear is removed after concrete wall is placed.

Lateral Strength of Bell-and-Spigot Joints

Results of a series of tests conducted at Ohio State University with the cooperation of the Cast-Iron Pipe Research Association and the Columbus, Ohio, department of water are summarized in a recent issue of the *Engineering Experiment Station News*. To date, the tests have included only bell-and-spigot poured joints of soft lead, some calked by hand, others with a pneumatic hammer. Materials to be investigated include alloy lead, portland cement and sulphur compounds.

Two sections of pipe, connected by the joint to be tested, are filled with water, and the pressure is raised by small increments, with a time interval of from 3 to 5 min. between each increase. When the first slip occurs, pressure is held constant until all movement ceases, and each succeeding rise in pressure is similarly treated until complete failure occurs. Relative movement at the joint is accurately measured at frequent intervals, and all leakage is caught and measured.

Conclusions reached are that there is little or no leakage in a joint until initial slip takes place. Nearly all the leakage occurs during the early stages of failure; after the spigot has had some movement, the leakage ceases, and the joints generally remain watertight until complete failure occurs. For a brief time a lead joint will sustain, without apparent stress, a larger load than it can resist over a long period.

Results of the partly completed series of tests on soft lead joints indicate that with this material, having a depth of $2\frac{1}{4}$ in., the unit pressure in pounds per square inch, p, at which incipient failure may be expected for any diameter pipe, d, is expressed by the equation

$$p = \frac{3700}{d + 5} - 37$$

Investigations have been suggested covering the effect of the pipe coatings or paints upon the tightness and strength of a joint, and the difference in tightness and strength that may be secured by calking the lead hot as against calking it cold.

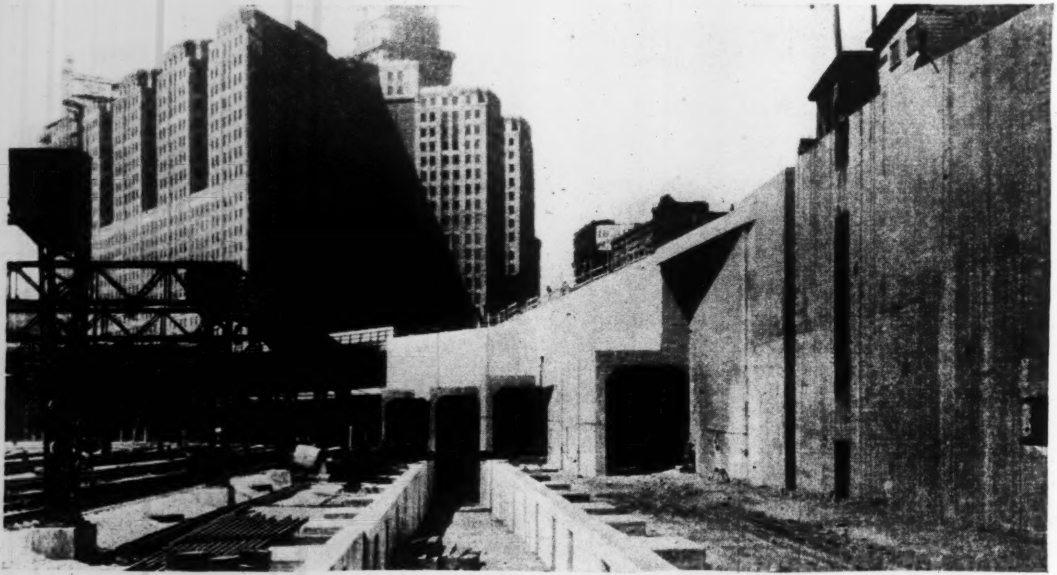


Fig. 1—Four-track portal, rapid-transit subway, Cleveland union terminal
Buildings in background are part of terminal development.

Rapid-Transit Lines' Subway Into Cleveland Union Terminal Built Under Busy Street

Cut 65 ft. deep alongside old buildings required for four-track subway under Ontario St.—Traffic detoured over temporary trestles—Utilities supported on piling

By LESTER C. ROGERS
District Manager, Bates & Rogers Construction Co., Cleveland, Ohio

IN ORDER to bring the rapid-transit lines from the East into Cleveland's newly completed union terminal, it was necessary to utilize the space occupied by a bend in busy Ontario St., from a point just north of High St. to a point south of Huron Road, a distance of 824 ft. This involved excavation to an average depth of 45 ft. and a maximum of 65 ft. below the street level along a line that approached as close as 8 ft. to existing buildings; the necessary supporting of these buildings, two to five stories in height and some a half century old; the detouring or supporting and maintaining in their original position of various utilities in the street; the constructon of a four-track, reinforced-concrete box-type subway; 20 ft. of backfilling on top of the completed concrete structure; replacement of all utilities in their original position; and the restoration of the street pavement.

Soil conditions added materially to difficulties and hazards of construction. The top 34 ft. of cover was fine, closely compacted yellow sand underneath which was a 2-ft. layer of very fine gray water-bearing sand carrying a heavy flow of water on top of the stiff blue clay that formed the remaining 9 to 29 ft. of excavation.

Design of Structure—As shown in Fig. 2, the concrete structure was designed as a reinforced box, with a back wall 824 ft. long, carrying four tracks in the widest portion. The third track from the back wall was depressed at a 4 per cent grade to a maximum of 20 ft. below the level of the adjoining tracks, to permit the construction of a turnout to the east at Huron Road under two tracks, for possible future subway construction in that street.

The footings are continuous mats 4 ft. thick. Pier walls between tracks are 2 ft. wide. The retaining wall along the east side of the subway is of the counterforted type. Decks are 3 ft. thick. Both decks and footings on the single-track spans are of heavy reinforced concrete; on double tracks the spans are heavy I-beams incased in concrete. The depressed track is reinforced to form an integral part of the footing with 3-ft. walls and a 4-ft. floor. The box itself has 18½ ft. of clearance from top of footing to under side of deck. The remaining distance to street level consists of 20 ft. of sand backfill retained on the box at the westerly side by a 2-ft. wall. Stress in this wall is carried by reinforcing through the deck and easterly retaining wall to the footing.

Construction

Detour Trestle—The first operation in the construction program was the building of two temporary pile-and-timber detour trestles to carry Ontario St. traffic during the course of the work (Fig. 3). The trestles were driven with turntable drivers operating on top of the structure, and they required 22,000 lin.ft. of 55-ft. piles, 580,000 b.ft. of timber and 75 tons of I-beams.

Utilities—The flow of a 3x4-ft. brick sewer in Ontario St. was immediately taken care of, partly by diversion, with the overflow carried through a 30-in. temporary sewer constructed 22 ft. below the east sidewalk of

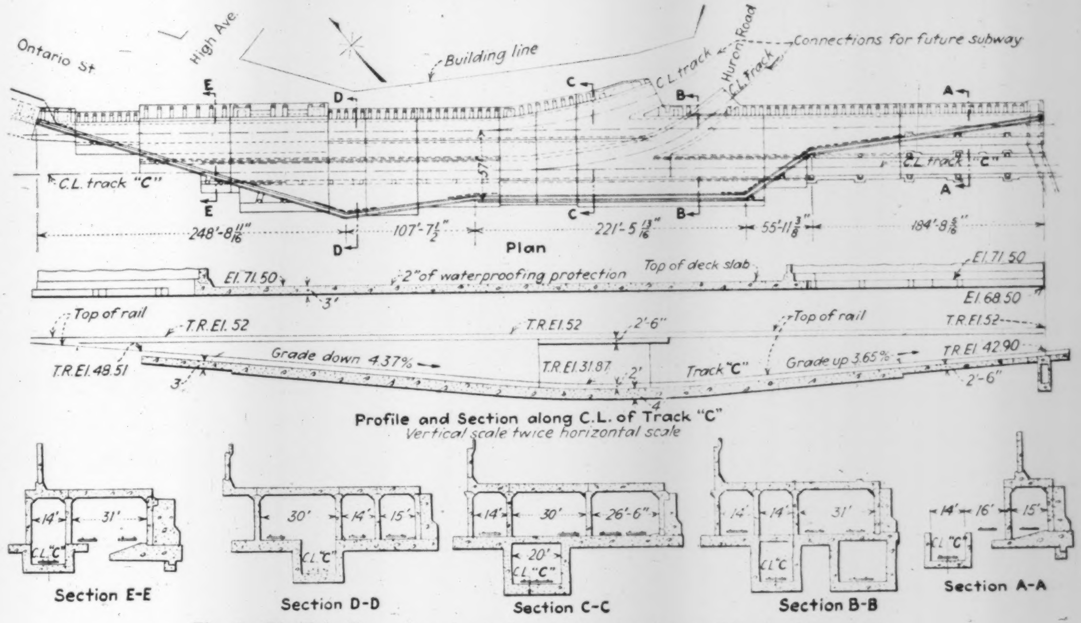

Ontario St
High Ave.
Building line
C.L. track
Huron Road
C.L. track
Connections for future subway
E
D
C
B
A
C.L. track "C"
57'
248'-8 11/16"
107'-7 1/2"
221'-5 13/16"
55'-11 3/8"
184'-8 5/8"
Plan
El. 71.50
2" of waterproofing protection
Top of deck slab
El. 71.50
El. 68.50
3'
Top of rail
T.R. El. 52
T.R. El. 52
2'-6"
Top of rail
T.R. El. 52
T.R. El. 48.51
Grade down 4.37%
T.R. El. 31.87
2'
Track "C"
Grade up 3.65%
T.R. El. 42.90
2'-6"
3'
4'
Profile and Section along C.L. of Track "C"
Vertical scale twice horizontal scale
14'
31'
C.L. "C"
Section E-E
30'
14'
15'
C.L. "C"
Section D-D
14'
30'
26'-6"
20'
C.L. "C"
Section C-C
14'
14'
31'
C.L. "C"
Section B-B
14'
16'
15'
C.L. "C"
Section A-A

Fig. 2—Plan, profile and sections of rapid-transit subway, Cleveland terminal

Design provides for connection with future subway in Huron Rd.

Ontario St., between the buildings and the line of the steel sheeting at the proposed excavation line. The temporary sewer was built of corrugated metal pipe to withstand probable settlement as the adjacent construction progressed. An 8-in. low-pressure and a 12-in. high-pressure water line, 8-in. and 10-in. gas lines and two power duct lines were also detoured and the existing lines removed.

The remaining utilities—a 54-duct tile and concrete subway of the Ohio Bell Telephone Co., weighing over a ton per foot of length, three electric-power subways of 36-, 24- and 9-duct size and a 16-in. steam line—were left in place and supported on piling (Fig. 6). These piles, 55 ft. long, were driven from street level. They drove extremely hard because of the nature of the soil penetrated, in order to get the required 50 ft. of penetration. The utilities were then uncovered, and caps and stringers of timber or steel, depending upon spans and loads, were placed to complete the utility supports.

Cofferdam—The design of the cofferdam presented a serious problem. Inasmuch as all soil west of the easterly line of the project was to be removed, it was necessary to support a 45-ft. bank containing a water-bearing stratum three-fourths of the way down from the top, with two- to five-story old buildings on the top of the bank. This support required a system of sloping braces adequate to prevent settlement of and damage to the buildings. The walls of these buildings were of brick and stone masonry with little or no footing, resting on the sand 12 to 15 ft. below sidewalk level. The choice of an adequate means for taking the thrust at the base of the sloping braces decided in large measure the success of the supporting method. It was decided that the depressed track, which was actually a reinforced-concrete trough with 3-ft. walls and 4-ft. floor, would serve as an excellent base for shoring the bank.

A line of 35-lb. 56-ft. arch-web steel sheeting was driven 1 ft. east of the easterly line of the retaining-wall footing from end to end of the job. Previous experience had proved that, with the extremely difficult driving conditions offered by the existing soil formation, a satisfactory cofferdam could not be obtained by driving full-length sheeting that was 56 ft. long a piece or two at a time to its final depth. Sand would pack so tightly in the groove of the interlock that the lug of the succeeding pile would frequently be forced entirely out of the interlock in the last quarter of its depth, leaving dangerous openings in the wall of sheeting. To guard against this condition, it was decided to use two 28-ft. lengths instead of a single 56-ft. length, splicing the two pieces with standard splice plates. A line of 50 to 75 28-ft. sheets was set up at one time, carefully plumbed, and the entire line was driven uniformly 4 or 5 ft. at a time to prevent the accumulation of sand in the interlock and to insure a plumb line of sheeting. The second section was spliced on when the first had been driven nearly to ground level, and a similar driving procedure

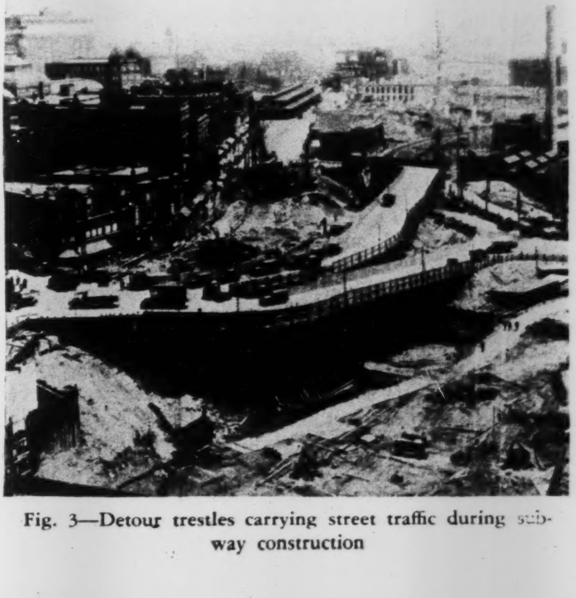


Fig. 3—Detour trestles carrying street traffic during subway construction

followed. The success of this method was demonstrated when the excavation was removed and a perfect line of sheeting was uncovered. The driving was done with two cranes working in tandem, one setting and driving, the other driving. Double-acting steam hammers were used, equipped with special guides and driving blocks to keep the hammer plumb and to minimize the damage to the top of the first section of sheeting, to which a splice was later to be attached. To obtain full penetration, often as many as 700 blows were required per inch of penetration.

Because this line of sheeting was to be braced against the heavy walls of the depressed track, it was necessary that the track be constructed as early as possible. Study of the plans revealed that an undisturbed bank with a 1½ : 1 slope could be left against the steel sheeting from street level to subgrade, between sheeting line and the near side of the depressed track. This slope was considered amply sufficient to support the bank during the construction of the depressed track. However, due to the flow of water over the clay it was necessary to use sheeting along the bank side of the depressed track that was long enough to reach above this water in order to maintain this slope. This additional 7 ft. of sheeting was removed as the bracing was placed, but all other steel sheeting for the depressed track was left in place with the wall concrete poured against it to preclude any possible settlement in adjacent ground.

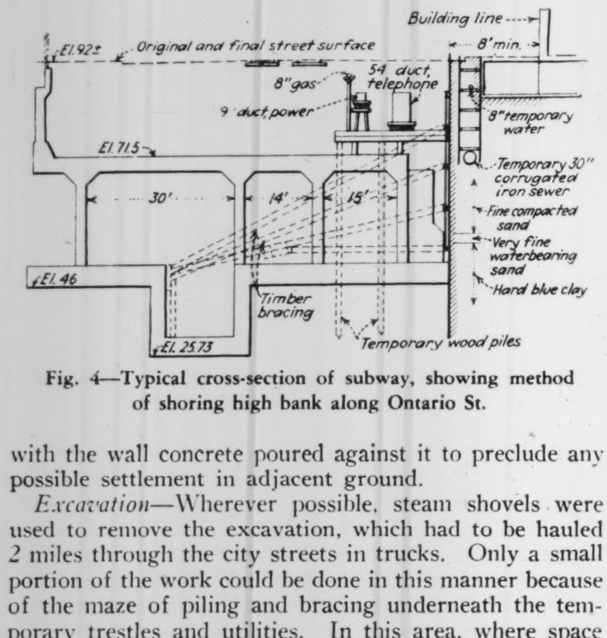


Fig. 4—Typical cross-section of subway, showing method of shoring high bank along Ontario St.

Excavation—Wherever possible, steam shovels were used to remove the excavation, which had to be hauled 2 miles through the city streets in trucks. Only a small portion of the work could be done in this manner because of the maze of piling and bracing underneath the temporary trestles and utilities. In this area, where space was limited, a conveyor loader was used to excellent advantage in the removal and loading of the sand into trucks. The bulk of the clay, however, had to be excavated by hand, using air spades, although cranes equipped with clamshells were used both from the street level and track level wherever possible. Excavation of the depressed track presented another problem, for it lay almost wholly underneath the utility lines and temporary trestles. The material here was stiff blue clay that had to be dug from 5 to 25 ft. below track level. This excavation was handled by a small heavy traveling derrick (Fig. 7) built just wide enough to move along within the steel sheeting on temporary bents and stringers, which were moved ahead as the excavation progressed. Utility and trestle supports did not interfere with the travel of the derrick, as they were designed to span the trench for this track. As the machine traveled ahead the clay was removed to full depth. No side swing was possible because of the supporting piling and bracing, so that the excavating was done with a high boom and the trucks were loaded ahead by lowering the boom.

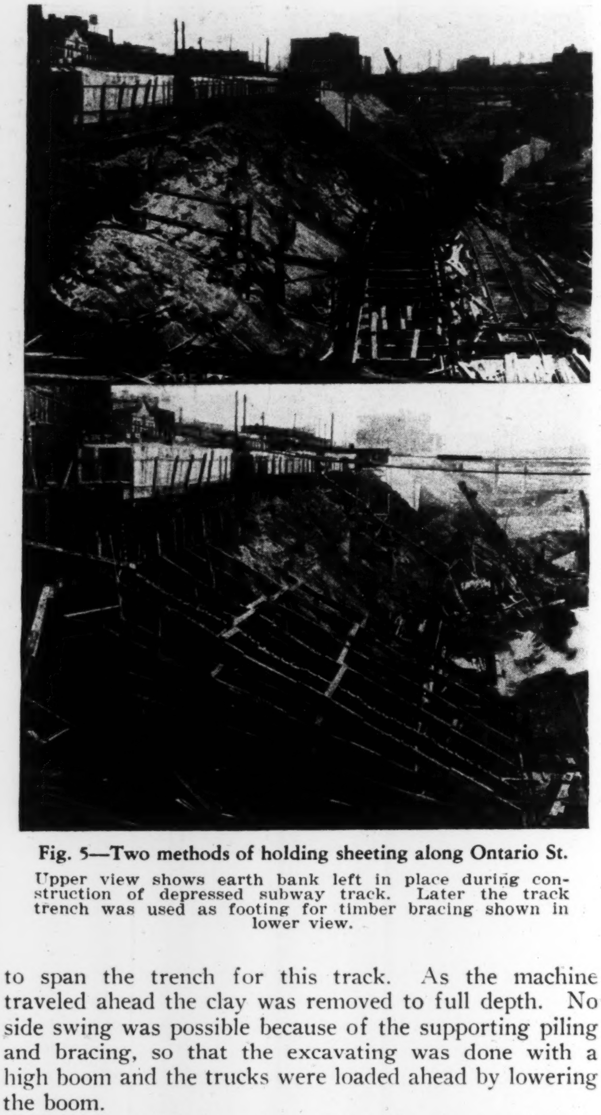


Fig. 5—Two methods of holding sheeting along Ontario St.

Upper view shows earth bank left in place during construction of depressed subway track. Later the track trench was used as footing for timber bracing shown in lower view.

Cofferdam Bracing—As soon as the depressed track was excavated, concreted and sufficiently cured, a row of 14x14-in. timber braces on 14-ft. centers was laid on the sloping bank of earth with the upper end resting against a 73½-lb. H-beam wale set against the steel sheeting 12 ft. below the top (Fig. 5). The lower end of the timber butted against the wall of the depressed track. These braces were forced into place with two 15-ton jacks in order to take up all possible chance of slack, which would permit settlement of the adjacent buildings. The upward thrust on the H-beam wale was transmitted through posts at frequent intervals to an I-beam bolted along the top of the steel sheeting. With the first row of bracing placed, excavation proceeded on the slope until a point 8½ ft. below the first wale had been reached. Here the second wale and second set of timbers were placed. In the same manner and at the same intervals four sets of steel wales and timber braces were placed with every timber stressed to 30 tons pressure (Fig. 4).

Protection of Buildings—Prior to commencing any operations a thorough survey was made of all the buildings, both inside and out, to determine their exact condition, both for the purpose of determining any future

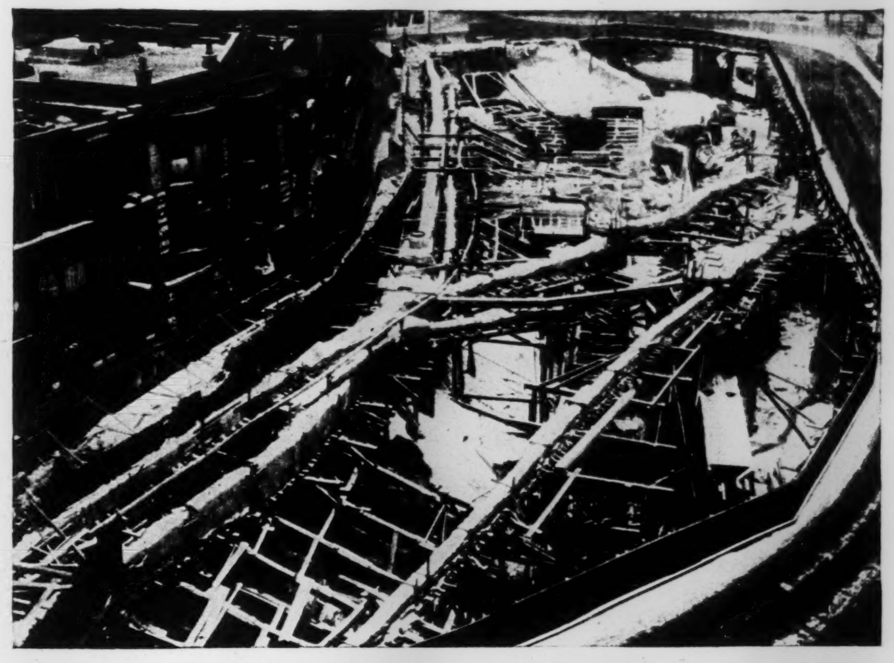


Fig. 6—Temporary trestles carry utilities remaining undisturbed during construction operations

settlement and for protection against possible damage suits. All walls were checked for plumb and line. An accurate series of levels was run with several points on each building, and detailed notes and photographs were made of the interior and exterior conditions in each structure. Frequent checks were made on the elevations, so that it was possible to detect any settlement in the buildings instantly. Because of extreme care in driving the steel sheeting and jacking the bracing into place, only two buildings showed settlement—one a two-story brick structure, which was nearest to the sheeting; and the other a 50-year-old five-story brick building. Each was then supported by needle beams through the side walls near the front of the building. These needle beams in turn were carried on jacks placed on timber cribbing. In a similar manner each column in the front of the building was supported. It was then possible with daily level readings to take up any settlement with a few turns on the jacks and to maintain the structure at its original elevation. The five-story structure was in very poor shape due to age and apparent frequent remodeling, and the sides had to be held together and the front tied back with several heavy tierods. After the entire project was completed and the backfill on top of the concrete subway and against the steel sheeting had settled for several months, the footings under the front portions of these buildings were replaced or repaired as required, the walls and columns were bricked up and the jacks removed, leaving the structures at the same elevation as when the work was started.

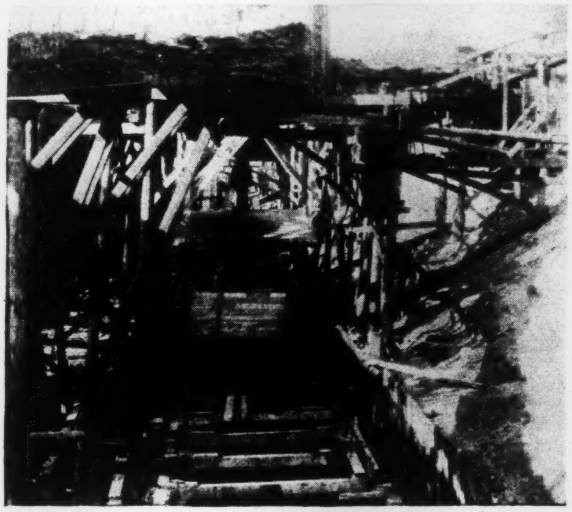


Fig. 7—Excavation of depressed track trench in close quarters with special traveler

Construction of the Box—Although all pier walls were similar in design, height and thickness, no scheme of large panel forms could be used because of interference from bracing, utility supports and temporary trestles. Thus it was necessary to build most of the forms in place, and the use of panel forms was restricted to small panels, 4x6 ft., which could be worked in around the bracing.

QUANTITIES, ONTARIO ST. WORK

Piles in trestles and utility supports, lin.ft	21,000
Timber in trestles and utility supports, b.ft	580,000
Structural steel, lb	142,000
Excavation, cu.yd	176,000
Backfill, cu.yd	32,000
Steel sheeting, lb	3,905,000
Steel bracing, lb	259,000
Timber bracing, b.ft	726,000
Reinforcing, lb	4,243,255
Structural steel, lb	2,922,000
Concrete, cu.yd	27,500

Concrete aggregates were delivered to the job in measured batches deposited directly into the skip of a 1-cu.yd. paving mixer. Cement was put in at the mixer. It was possible to move the mixer around on the streets and the temporary trestle above the work in such manner that the concrete was mostly placed with a few lengths of chutes without wheeling or rehandling. During cold weather both aggregates and water were heated, and the concrete was heated with steam and protected with tarpaulins for 72 hours after pouring. All the work was carried on in two eight-hour shifts, except that a large part of the foundation work was done continuously in three eight-hour shifts.

The approximate quantities involved in the work are shown in the accompanying table.

Organization—H. D. Jouett, chief engineer, was in charge of the work for the Cleveland Union Terminals Co., with C. P. Marsh as engineer of design, N. H. Suloff engineer of construction, and H. P. Bigelow as field engineer. Bates & Rogers Construction Co., of Chicago, was the contractor, the work being handled by its Cleveland office under L. C. Rogers, district manager, with C. T. Smith superintendent on the work.

Deadwood Dam Construction Work Controlled by 60-Mile Truck Haul

By R. J. NEWELL
Construction Engineer, Deadwood Dam, Boise, Idaho

DEADWOOD DAM, constructed in 1929-30, is an additional element of the Boise irrigation project in Idaho. General details and dimensions of the 153-ft. structure are given in the accompanying drawing.

Delivery of materials was the controlling factor in the construction. The site was a mile high in the mountains and was made inaccessible for heavy haulage for nearly six months of the year by snow. The specifications limited to 90 days the storage of cement at the dam; virtually all cement hauling was therefore confined to the open season of 1930. The distance of haul was 60 miles over forest service and construction roads. The same long hard haul was required for construction equipment, permanent equipment for the dam and all construction materials (except aggregates that were produced on the work) and camp and plant services. Roadbuilding, snow-clearing and truck operation were the exacting problems of the dam construction.

A Forest Service highway led from Cascade, Idaho (the nearest railroad point—about 60 miles distant), over a circuitous route to within 11 miles of the dam site. The maximum grade was 8 per cent, the width small and the curvature high; three mountain summits were crossed at elevations from 6,800 to 7,400 ft. The building of 8½ miles of construction road from the nearest point on this forest highway to the upper end of the reservoir basin, at the expense of the United States, was provided for in the contract for the dam. The remaining 3 miles to the dam was graded for temporary use by the contractor.

The contractor began work about Aug. 1, 1929. The construction road was completed, camp and plant erected, excavation for the dam roughed out and the river diverted into a flume before the work was shut down for the winter in December. Work was resumed on March 18, 1930, the vanguard of the force reaching camp by means of snowshoes or dog sleds.

Delivery of cement made it vitally necessary to open the road at the earliest possible date. Work was begun at Cascade on March 1 with a snow plow handled by two 60-hp. tractors and a gang of shovelers. Occasional through-trips were made over the snow with crawlers and sled to deliver essential supplies. Snow removal was also started from the dam end. The road was broken through on May 18 after two and a half months' work at an expense of $8,000. It is likely that the snow would have been cleared by the sun not more than twenty days later, but that twenty days' delay would probably have prevented completion of the dam during 1930.

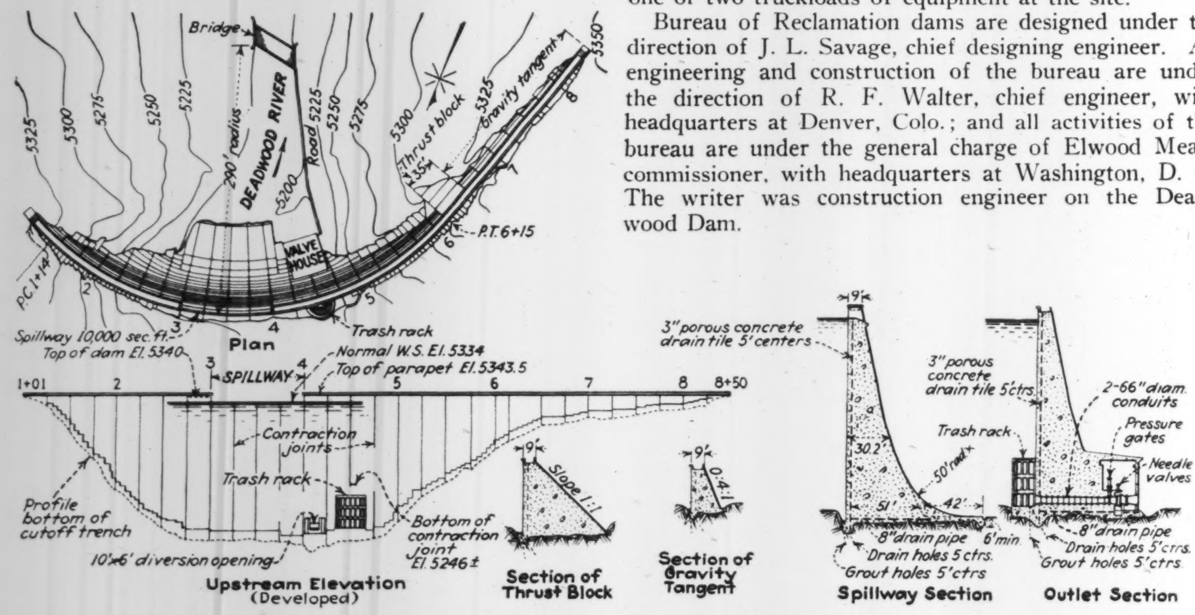
The contract for hauling was sublet to Knowles Bros., of Colorado. After the preliminary hauling in 1929, four additional trucks with trailers were built to their order designed especially for the Deadwood hauling. The trucks were equipped with dual wheels on the rear and on the trailers, had 200-hp. motors and were four-wheel drive with an auxiliary high gear designed for the ruling grades on the route. Both trucks and trailers were controlled by air brakes.

The loads were 150 sacks of cement on the truck and 100 on the trailer. Thus the four special trucks hauled one 1,000-sack car of cement at a trip. Unloading at the dam was accomplished by tipping the truck. One driver would unload 250 sacks in five minutes.

From June 1 to Oct. 15 the trucks made two round trips a day practically without a break. This was so near the maximum possible that back-haul was refused for fear that the extra loading time would defeat the schedule. Four smaller trucks, running usually one trip per day, made up the remainder of the hauling capacity. Cement was hauled for $8.50 per ton, or about 12.7c. per ton-mile.

Concrete pouring was begun on June 3 and completed on Nov. 7, 1930. Work generally was completed by Nov. 16. The contractor's moving out was interrupted by the usual snowstorm, and it was necessary to leave one or two truckloads of equipment at the site.

Bureau of Reclamation dams are designed under the direction of J. L. Savage, chief designing engineer. All engineering and construction of the bureau are under the direction of R. F. Walter, chief engineer, with headquarters at Denver, Colo.; and all activities of the bureau are under the general charge of Elwood Mead, commissioner, with headquarters at Washington, D. C. The writer was construction engineer on the Deadwood Dam.


Bridge
290' radius
DEADWOOD RIVER
Road
5325
5300
5275
5250
5225
5200
5350
Thrust block
35'
Gravity tangent
VALVE HOUSE
P.C. 1+14
P.T. 6+15
2
3
4
5
6
7
8
Spillway 10,000 sec. ft.
Trash rack
Plan
Top of dam El. 5340
Normal W.S. El. 5334
Top of parapet El. 5343.5
SPILLWAY
1+01
8+50
Contraction joints
Trash rack
Profile bottom of cutoff trench
Bottom of contraction joint El. 5246±
10'×6' diversion opening
Upstream Elevation (Developed)
9'
Slope 1:1
Section of Thrust Block
9'
0.4:1
Section of Gravity Tangent
3" porous concrete drain tile 5' centers
30.2'
50' rad.±
51'
42'
8" drain pipe
6' min.
Drain holes 5 ctrs.
Grout holes 5' ctrs
Spillway Section
3" porous concrete drain tile 5' ctrs.
2-66" diam. conduits
Trash rack
Pressure gates
Needle valves
8" drain pipe
Drain holes 5' ctrs.
Grout holes 5' ctrs.
Outlet Section

Structural details of Deadwood Dam, Boise irrigation project

FROM JOB AND OFFICE

Hints That Cut Cost and Time for the Contractor and Engineer

Graphical Earthwork Computation

By HALBERT T. JOHNSON

City Engineer, Paso Robles, Calif.

GRAPHIC methods for the solution of engineering problems are so common that it is strange they have not been applied to the calculation of earthwork, the major problem of most highway, railroad or canal locators. It is true that we have the mass diagram, but that is a plotting of calculated quantities rather than a determination of them, and it does not present a very clear picture of the location and extent of the excesses of cut and fill.

A graphic average end area computation that gives an accurate and complete solution to earthwork problems was developed by the author in February, 1912, and has since been used successfully on a number of canal and road location surveys. Results of this experience indicate that the method deserves a place on every job where the balance of cut and fill yardages is a factor. Reference to the illustration will show the method of plotting.

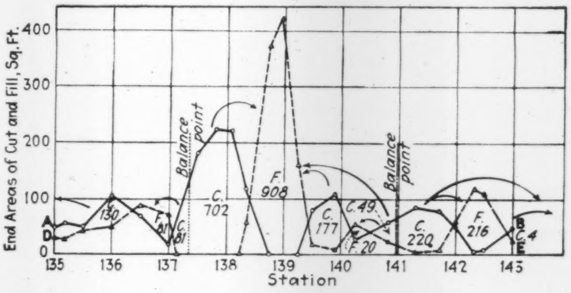


Diagram for planning earthwork operation

Center-line stations are laid off to scale along a base line, and the cut area at each cross-section is plotted to scale above the corresponding station. The area between the base line and the line *AB*, which connects the plotted points, when measured by a planimeter and multiplied by an appropriate constant, gives the total cut volume. Similarly, a line *DE* is plotted to represent fills, the calculated quantities from the cross-sections being increased by a suitable shrinkage factor.

Superimposing the fill diagram over the cut diagram shows much more than when the two are plotted separately, for the volume per linear foot of cut, of fill, and of excess of either is shown at any point. The area under the lower line is proportional to the balanced cut and fill at any point, and the area between the lines represents excess cut when *AB* (solid) is above and excess fill when *DE* (dotted) is above. The amounts of the excesses can readily be determined with the planimeter, after which the balance points and the directions and distances of haul are easily determined.

The accuracy of the results will depend on the scale of the diagram, the care used in plotting and the skill used in operating the planimeter.

Variations due to curvature may be allowed for on the diagram by reducing or increasing areas on the curve proportionately as the distances measured on their centers of gravity are greater or less than the distances on the center line. Thus, if a cut area is 100 sq.ft. but its center of gravity is 20 ft. from the center line on the inside of a 200-ft. radius curve, it should be plotted on the diagram as 90 sq.ft. instead of 100. If, however, this section is at the beginning or end of a curve, 90 sq.ft. should be used in drawing the volume line toward the curve, but 100 sq.ft. for the volume line of the adjoining tangent, thus making a vertical break on the diagram at this point.

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Tools for Center-Joint Construction

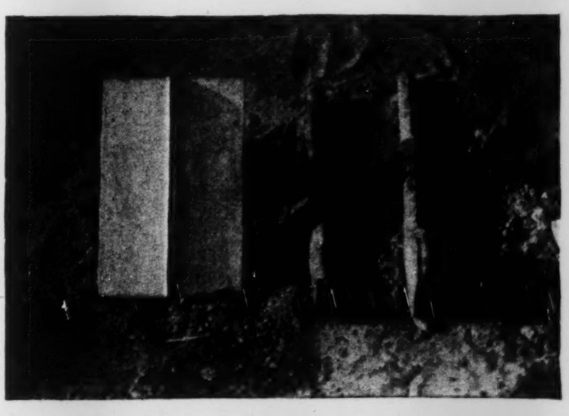
By W. E. BARKER

Portland Cement Association, Chicago, Ill.

PENNSYLVANIA requires that metal plates used in highway center joints be straightened and trued to line and grade after concrete is deposited. Contractors have consequently developed special methods and special tools seldom found outside that state. Center-joint construction on route 351, south of Erie, by Lewis & Copeland, of Lima, Ohio, was unique enough to warrant special mention.

The deformed metal plate was set some distance ahead of the mixer, to both line and grade. The mixer skip was provided with a channel through which the center plate ran, and trucks straddled it as they backed to the skip. After each move of the mixer the first batch was divided equally on each side. Even with the greatest care in depositing the concrete, however, the plate was frequently forced slightly out of line because the newer type of finishing machines, consolidating by pressure, push the concrete with enough force to bend it.

On this job two men straightened and edged the center joint, working from a traveling bridge. The plate was first uncovered by running a small trowel, held at an angle, along each side. Any kinks or waves in the metal were then corrected, using rods split at one end to fit over the plate. One rod with a long split was used



Tools for center-joint installation

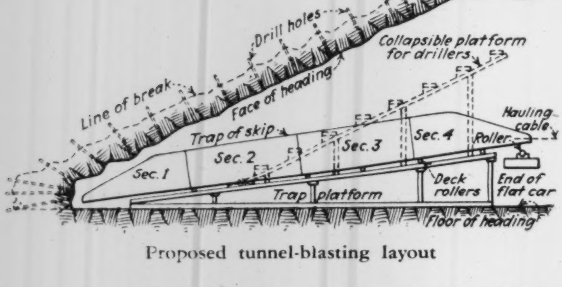
in straightening large kinks; another with a short split for the shorter kinks. Following the straightening the line of the plate was checked with a chalk line. The joint was then edged with a tool like a small float with a raised bead or lip bisecting it longitudinally. The lip that forms the groove above the plate and rounds the edges of the slabs is split so that it fits over the center plate, which acts as a guide. After the concrete had hardened, the slot above the plate was filled with bitumen.

Proposed Method of Tunneling

FOR RAPID and economical tunnel work in rock or other material that does not require timbering, a novel method is proposed in which the two outstanding features are; (1) an inclined overhanginig tunnel face; and (2) the use of traps or special skips into which the blasted material falls. This method is illustrated in the accompanying drawing. The trap, with a capacity of 250 tons of rock, is intended to be of 3-in. steel plate and to consist of four sections which partly telescope. Just prior to blasting, these sections are to be placed upon a sloping platform directly under the inclined tunnel face. Time exploders will cause the bottom holes to be discharged first, in order to load the maximum amount of rock at the lower end of the trap. It is estimated that about 90 per cent of the rock will fall into the trap.

With a train of four flat cars backed up to the sloping platform, each section of the loaded trap will be hauled onto a car by a hoist on the locomotive, the platfrom and cars being equipped with deck rollers to facilitate this movement. The small amount of muck not caught by the trap will be loaded into a small skip while drilling is in progress for the next blast. For the drillers a collapsible platform with stepped deck, having the same inclination as the desired tunnel face, is to be erected temporarily upon the sloping trap platfrom, which has been jacked ahead to the tunnel after the last blast. Upon completion of drilling and loading, the drillers' platform will be removed to allow the placing of the trap.

It is stated that this method should result not only in decreased cost but also in increased progress of at least 40 ft. per 24 hours in ordinary limestone formation. The main advantages claimed are: (1) the ability to pull or advance a face 12 ft. horizontally by the use of drill holes only 6 or 7 ft. deep; (2) the use of a greater number of drills at one time, due to the increased surface of the tunnel face; (3) not more than two sizes of drill steel required, due to the relatively short holes; (4) reduced time of setting up drills, due to the use of stoper operated from the platform for most of the holes; (5) reduction in quantity of powder, due to more advantageous location of charge; (6) less overbreak; (7) less smoke and gas; (8) greatly reduced mucking cost.



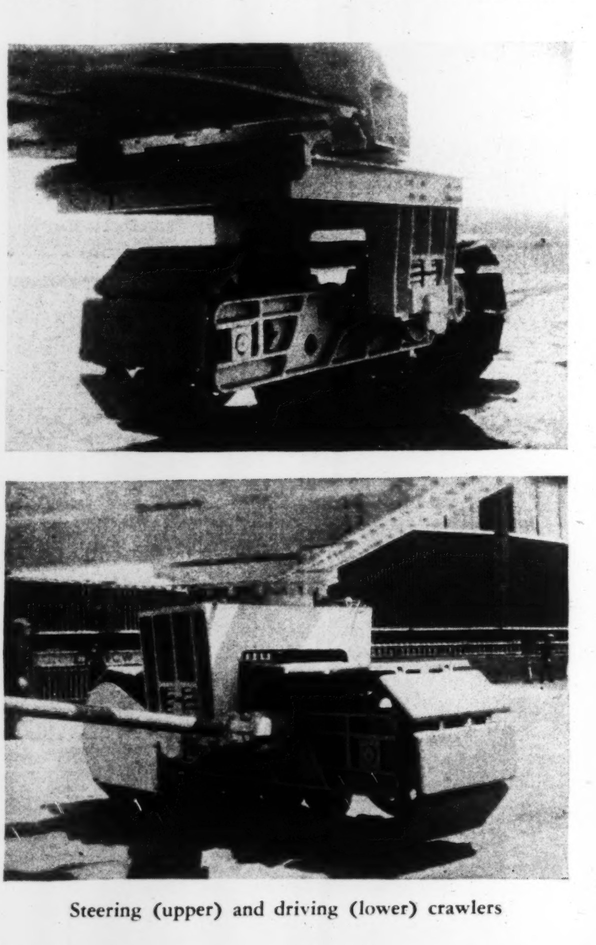
Proposed tunnel-blasting layout

This method of tunneling was designed and worked out by H. H. Fisher, construction superintendent for the Byllesby Engineering & Management Corp., Chicago. It has been patented by him as a protection, but it is understood that permission to use it will be granted without charge to any reliable tunnel contractor.

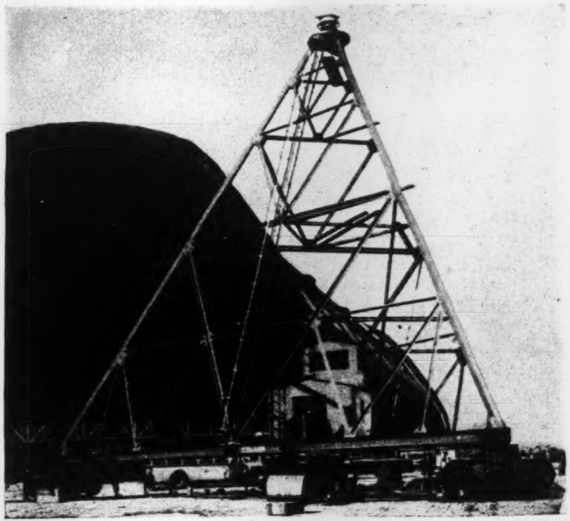
Self-Propelling Mooring Tower Handles Akron Dirigibles

TO SIMPLIFY the work of landing and berthing dirigibles through a reduction in the size of the ground crews and at the same time to provide for outdoor mooring, the Goodyear Zeppelin Corp. has just put into service at its Akron, Ohio, airdock an improved type of landing and mooring machine designed and built for it by the Wellman Engineering Co., of Cleveland. The machine went through its trials a few weeks ago. It is a 125-ton structure capable of hauling in the largest airship, holding it against any wind and moving it into the shed. Its three crawler supports can operate on either the earth or the concrete floor of the dirigible shed, although the tower is intended mainly for outdoor service.

The tower is a triangular pyramid on three crawlers set on a 125-ft. circle, is 76 ft. high, carries a gasoline power plant that drives all motions by variable-voltage direct-current shunt motors, travels at speeds up to 2 m.p.h., steers, and hauls in the landing line through a hole in the spindle of a mooring cup at the peak. Two crawlers are carried by fixed saddles and are motor-



Steering (upper) and driving (lower) crawlers


Wide World Photo

Mobile mooring tower for large dirigibles
Height, 76 ft.; base triangle, 85 ft. along each side; weight, 125 tons.

driven, while the third or steering crawler has its saddle pivoted on a king-pin and is turned by a pinion engaging a gear segment. The crawlers are spring-mounted and are equalized on their saddle castings. The mooring cup at the peak turns on a spindle set in anti-friction bearings; just below it is a circular platform.

Power is generated by a gasoline-electric plant housed on the lower framing All motions are manipulated from a control cabin on the roof of the powerhouse.

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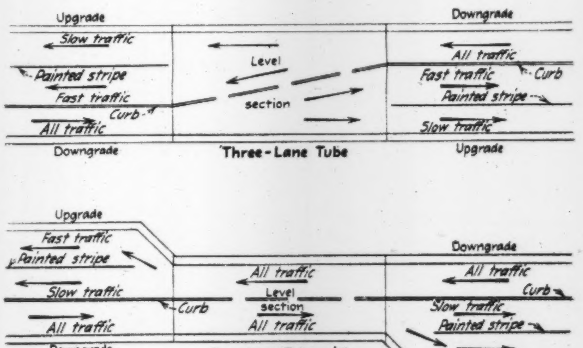
Proposal to Relieve Congestion in Vehicular Tubes

By LOCHIEL M. KING
Consulting Engineer, Alameda, Calif.

TRAFFIC congestion in a vehicular tunnel, with resulting inconvenience from slow-moving cars, engines running at poor efficiency and the accompanying smoke and fumes, is particularly apt to occur at the upgrade exit. It is not uncommon to have a heavily loaded truck delay an entire line of passenger vehicles. In three-lane tunnels a suggested solution for this problem would be to divide the exit by a curb at the one-third point, so that upgrade traffic would use two lanes and all downgrade traffic a single lane. Downgrade traffic is not impeded to the same extent by slow-moving vehicles, and the single lane is sufficient. Along the level section of the tube or underpass this curb would extend diagonally across the roadway to the opposite third point at the beginning of the adverse grade on the other end. Here the provision would be the same on a reverse plan. In the level section traffic would naturally, or according to instructions, segregate before reaching the exit grade.

In the case of two-lane tunnels an adaptation of this general plan would be to provide three lanes on the approaches and place the same system in operation. In this case the extra lane of traffic could be added on the outside of the exit lane, which would permit the curb to extend through the tube in a straight line. It would maintain the two lanes in the level section, and on the approach would separate the three-lane section into a single-lane downgrade and two lanes upgrade.

The result accomplished in either case would be provision for bypassing rapid traffic on the upgrade around slow-moving trucks and cars, with elimination of consequent delay and inconvenience. The general arrangement of the proposed system is indicated in the accompanying plan.


Upgrade
Slow traffic
Painted stripe
Fast traffic
Curb
All traffic
Downgrade
Level
section
Three-Lane Tube
Downgrade
All traffic
Fast traffic
Curb
Painted stripe
Slow traffic
Upgrade
Upgrade
Fast traffic
Painted stripe
Slow traffic
Curb
All traffic
Downgrade
All traffic
Level
section
All traffic
Two-Lane Tube with Widened Inclines
Downgrade
All traffic
Curb
Slow traffic
Painted stripe
Fast traffic
Upgrade

Allocation of tunnel space to avoid congestion

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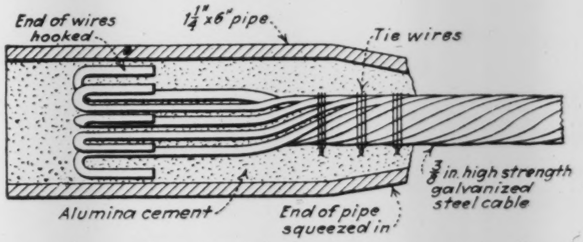
Socketing Cable Test Specimens With High-Early-Strength Cement

By W. K. HATT
Head, School of Engineering, Purdue University, Lafayette, Ind.

RECENTLY a series of tension tests was carried on in the testing materials laboratory of Purdue University on high-strength galvanized steel cables. Of prime importance in these tests was the question of holding the twisted cable in the testing machine in a manner that would result in no ill-effect on the cable ends. The method of socketing the ends of a test length of cable by pouring hot metal around the cold-drawn wire often produces a softening effect near or in the socket. Direct gripping of the cable in the serrated faces of the testing machine often results in premature failure in the individual wires where the grips have pressed into these wires. As a result of the studies there were developed a new method for socketing the cable ends, which not only held the cable firmly and located the fracture outside of the sockets but also prevented torsion of the cable in the pulling test.


End of wires hooked
1¼"x6" pipe
Tie wires
⅜ in. high strength galvanized steel cable
Alumina cement
End of pipe squeezed in

Cement socket for cable testing

This new method of socketing employs the principle of developing bond strength greater than the tensile strength by the application of a high-early-strength cement to the separate wires of the cable at normal air temperature. The accompanying sketch shows the arrangement. Small-diameter tiewires of soft steel were wrapped around the cable for a length of $1\frac{1}{2}$ in. to maintain the helix and to prevent the cable from unwrapping when cut. The cable was then cut $4\frac{1}{2}$ in. from the ties, the wires flared out and the ends bent backward so that they would fit into a $1\frac{1}{4}$-in. iron pipe. One end of a 6-in. length of $1\frac{1}{4}$-in. pipe was squeezed in so that a restraining action would be produced should the mass within tend to slide. The deformed end of the cable was inserted vertically into the pipe and nearly through it, and then a matrix of alumina cement, mixed with water to a stiff creamy consistency, was thoroughly puddled around the cable end and the separated wires. The sockets were kept in a moist place at a temperature of approximately 70 deg. F. for a period of about twelve hours and then placed in water for further curing. Experience has shown that the full cable strength can be obtained after 24 hours.

During the process of testing, these cable sockets are held in the wedge grips of the machine in a similar manner to the gripping of a round bar in a tension test. No crushing failure has occurred using the cement-filled sockets.

Interiors of Cast-Iron Tubes Finished With Scrubbing Block

By **S. D. MOXLEY**

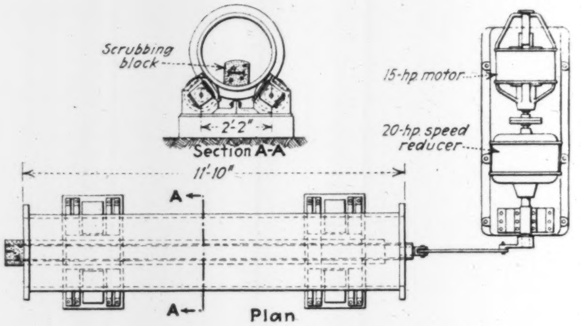
Chief Engineer, American Cast Iron Pipe Co., Birmingham, Ala.

FACED with the necessity of securing an extremely smooth finish, free from pits, irregularities or tool marks, on the interior of 60 cast-iron tubes 11 ft. 10 in. long and 22, 26 and 30 in. in diameter, the American Cast Iron Pipe Co. constructed the scrubbing machine herein described, using a concrete block with carborundum as the aggregate. Use of spare equipment available at the Birmingham plant made it possible to do the work at a total cost of only $786, as compared with a low bid of $3,420 submitted by a local machine shop for boring the tubes in the usual way.

Details of the mechanism are shown in the illustration. Four rollers were mounted on a foundation to support the tubes in a horizontal position and permit rotary motion. A block or scrubber 12 in. square and 12 ft. long was cast from a 1:3 mixture of portland cement and discarded carborundum wheels crushed to marble and egg size, with a 10-in. I-beam cast in for reinforcement. This scrubber was operated in a horizontal position on the bottom of the tube, being driven at a speed to give twenty-eight 4-in. strokes per minute. During this operation the tube was slowly revolved by hand, so that all high points and irregularities on the inside were ground off in a straight line longitudinally. One side of the scrubbing block was used until about 2 in. had been worn away; it was then turned over and the other side used a corresponding amount. Four blocks were necessary to finish the 60 tubes. Each one cost $6 and, when discarded, was recrushed into aggregate for use in casting a new block.

Driving power was provided by a 15-hp. variable-speed electric motor connected to a speed reducer and fitted with a crank and pin on the slow-speed shaft. The pin was connected to one end of the scrubber by a link, as shown in the illustration.

On the average, two tubes were finished per shift of 10 hours, about $\frac{1}{16}$ in. of metal being taken off of the inside wall. The most difficult tube required 30 hours for finishing, with $\frac{3}{8}$ in. of metal taken off. After finishing, the inside diameters of the tubes were calipered and found to be correct within $\frac{1}{32}$ in.



Plan and section of tube-finishing machine

During the operation, as metal was taken off the inside wall, there was a small collection of free graphite in the casting, which acted as a lubricant in the grinding operation. The introduction of small amounts of dry high-silica sand overcame the difficulty thus produced by absorbing the extra graphite. Wet scrubbing was tried with the same machine, but it was found that the speed of operation was materially retarded.

Following is the cost of finishing an average tube:

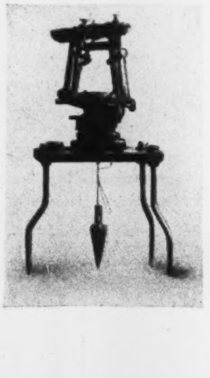
Cost of scrubber, per tube	$0.60
Labor, 25 hours at 50c.	12.50
Total	$13.10

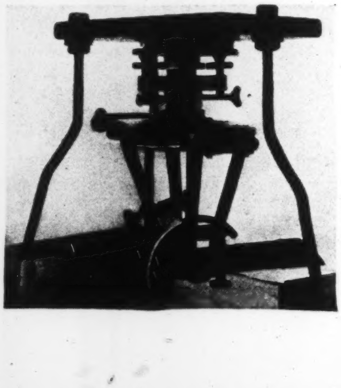
Although old equipment was used in building the scrubbing device, a very substantial saving would still have been effected even if it had been necessary to buy new equipment throughout. The estimated cost of such new equipment is as follows:

10-hp. electric motor and controller	$200
Speed reducer and base	300
Links, cranks and auxiliaries	50
Rollers	50
Foundation	10
Forms for casting scrubbing blocks	5
Total	$615

Job and Office Note

THREE LONG BOLTS and a plate are the only materials necessary to build this trivet for supporting a transit in either an upright or inverted position. The bolts are ground or forged to a point, and are bent to allow greater freedom in swiveling the instrument. The inverted position is advantageous when it is necessary to have the telescope near the plane of support, when sighting below a low obstruction, or when obtaining the deflection of a beam.—CEDRIC A. MARTIN, Coronado, Calif.





LETTERS TO THE EDITOR

Industrial Leadership

Sir—The appointment of E. J. Mehren as president of the Portland Cement Association gives to one of the country's oldest and outstanding trade associations the broad, disinterested and intelligent leadership which is imperative at this time.

Under Mr. Mehren's guidance the Portland Cement Association should have a new lease on life and regain its former position as the coordinating influence of one of the country's leading industries.

Mr. Mehren brings to his new duties a rare combination of personal qualities—technical knowledge, human understanding, an unusual appreciation of industry's responsibility to the general public and to a marked degree, good common sense.

It is anticipated that Mr. Mehren will receive the public recognition to which he is entitled and the good will, respect and cooperation of the association's staff.

New York City,
July 20, 1931.

H. STRUCKMANN,
President, International Cement Corporation.

Drivers' License Laws

Sir—I was greatly interested in Prof. Tucker's letter in the July 2 issue regarding the effectiveness of motor-vehicle drivers' license laws. I believe he should go a step farther and not only analyze the figures but the laws as well.

In his table Prof. Tucker lists Arizona as one of the states licensing drivers. If no other state had any more drastic law than was in effect in Arizona prior to July 1 of this year, no good effects should have been expected. All that was required of the owner of an automobile in this state was the registration of his car, a license to drive being issued at the same time. Any other member of the family over a certain age and with 50c. to spare could be licensed as well. The principal difference in the requirements for a chauffeur's license was a higher fee.

It can readily be seen that the effect on safety was practically nil. We hope, however, that the new law and highway patrol that became effective the first of this month will show some improvement.

Globe, Ariz.,
July 7, 1931.

E. H. ONEAL,
Old Dominion Co.

* * *

Sir—Referring to the letter by Prof. Tucker in the July 2 issue, p. 26, questioning the conclusions of our statistical study showing the beneficial effects of drivers' license laws, the chief error in Prof. Tucker's letter is that he uses figures for only a few states and for only two years. All vital statistics are subject to chance fluctuation. For this reason our study covered all the states for which U. S. Census Bureau records were available, and all the years since 1916. If we had gone back still farther, we should have had to decrease still further the number of states, because some of them came into the registration area just about that time. Starting with 1916 seemed to give the best combination of a maximum number of states and a maximum number of years.

There are just twelve states that had, during all or a part of the time covered, license laws conforming substantially to the national standard. We used all of these in the study. In nine of them the laws were adopted since 1916, thus permitting a "before and after" comparison. Without repeating the details of the statistical method followed (which are stated in full in our publications, furnished to anyone on request), the net result was an average index figure for the license states, after passage of such laws, 29 per cent below the index figure before such passage. For the three other states passing such laws before 1916, obviously no "before and after" comparison was possible, but the index figures showed precisely the cumulative downward trend, which Prof. Tucker says should be expected.

No one claims that a license law is the only influence affecting the accident rate. In view of the many other influences and the element of chance, it is almost too much to expect that, after the initial reduction, the license law states should show a consistent cumulative improvement each individual year. Assuming that Prof. Tucker's figures are correct and that they did not show any cumulative improvement in 1928 and 1929, they did in fact show such improvement in 1930. In that year all twelve of the states in the aggregate showed no increase in fatalities while the rest of the country showed about a 10 per cent increase.

Illinois did have a reduction in 1929, just why no one knows; but the 26 per cent increase in 1930 more than made up for this, and left Illinois with a rate higher than any of the comparable license law states, and much higher than most of them.

Finally, we agree that the mere enactment of a license law will not produce results; competent administration is necessary. But this is very important: it is only in the states having a standard license law that we find effective state administration of any motor vehicle laws. The license law put teeth into all the enforcement activities.

Chicago, Ill.,
July 18, 1931.

SIDNEY J. WILLIAMS,
Director, Public Safety Division,
National Safety Council.

Secondary Road Relocation —a Warning

Sir—Harry J. Kirk in his letter in *Engineering News-Record*, June 11, 1931, p. 984, seems to have analyzed correctly the conditions that are making for a change in policy in some localities regarding the construction of secondary roads. The writer wishes to sound a warning about carrying out plans for the construction of the cheaper types of road. The secondary roads of today will carry traffic a few years hence equal to that which the through roads bear at present, and unless consideration is given to the problems of location and design before the road becomes an important artery these problems will be difficult and expensive of solution.

Cheap forms of surfacing are perhaps a sensible and economical solution of the problem of secondary (or primary) roadbuilding, but temporizing with conditions as permanent as alignment, gradient and, to some extent, width will sooner or later present another problem to be corrected.

Examples of such conditions can be found everywhere. In my own state, Kentucky, a great deal of the highway system in the central section is a heritage from the pre-motor age, and the roads, like Topsy, "just growed." Today as a result we have heavy intercity traffic using excellent surfaces irretrievably wedded to antiquated location with its dangerous curves, approaches and hilltops.

A lack of understanding of future needs, or more likely a lack of necessary funds, was an excellent excuse for such conditions being brought about fifteen years ago. Today, however, it is possible to foresee the increase in use with sufficient accuracy to prevent a recurrence of such mistakes in general. Problems and factors that we cannot now foresee will be enough trouble to wish upon ourselves ten years hence.

Paintsville, Ky.,
June 30, 1931.

PAUL C. OWEN,
Resident Engineer,
Kentucky State Highway Department.

Collapse of a 72-Year-Old Bridge

Sir—The bridge at Clinton, N. J., of which a detailed description was given in my article, "60-Year-Old Iron Bridge in a New Jersey Village" (*ENR*, Nov. 11, 1920, p. 925), collapsed April 20, 1931, after 72 years' service. The bridge was of the "Lowthorp trapezoidal truss" type, three spans of 56½ ft. each with a 16-ft. clear roadway and a 5½-ft. sidewalk. Francis C. Lowthrop was widely known as a bridge builder in his day. He used cast iron for compression members and wrought iron for tension members. The collapsed bridge, built in 1859, was designed upon correct engineering principles. When I made my survey in 1920 I estimated that a live load of about 50 lb.

per sq.ft. had been used. Since the bridge was built the dead load had been increased by the addition of wood paving blocks to the floor. The 9-in. floor beams, each bearing the imprint "Patented Dec. 1, 1857," had been strengthened by trussing.

As all three spans had been removed when I was at the site and no technical information could be obtained, I am indebted to the local paper, the Clinton *Democrat*, for the details of the collapse.

A truck had nearly reached the first pier on the south side when it met a large sedan that had stopped to permit the truck to pass. The dead weight of the smaller car, coupled with the vibration of the truck, was sufficient to send this span crashing to the water's edge. Fortunately, the truck was far enough on the bridge so that the front wheels hooked over the pier and prevented its slipping back on top of the sedan. No one was injured. The bridge countless times had carried far heavier loads than was on it at the time of its collapse. A local truckman is said to have been running 16-ton loads of stone over it. Probably these large trucks heavily loaded had gradually racked the bridge, built in the days of horsedrawn vehicles, until it was in a weakened condition.

A new bridge, probably of concrete and steel, of wider roadway will be built. The abutments and piers are in bad condition and will need be partly replaced.

A near-by bridge, of the same type, of two spans each 85 ft., built on 1870 still stands. It bears a sign prohibiting loads in excess of six tons.

ROBINS FLEMING,
American Bridge Co.

New York City,
June 30, 1931.

Corpus Christi Dam Failure

Sir—La Fruta Dam, on the Nueces River about 35 miles northwest of the city of Corpus Christi, Tex., failed on Nov. 23, 1930. It was visited by the writer April 21, 1931.

An interesting feature of this structure is that it is neither built on bedrock nor connected with an impervious base. The floor of the valley in the reservoir site is a broad alluvial fill. The top is a heavy clay that in California would be called an adobe and which is apparently tight. The excavation in borrowpits and in the channel eroded at the time of the failure, above the break, show stratifications of coarse sands at depths of about 10 ft. and lower beneath the surface. Irregular lenses of fine sand that apparently is porous were observed in these banks. Borrowpits for obtaining material for the dam were excavated in this valley floor 100 or 200 ft. above the structure, and this exposed the porous material. The river had established a natural channel in this valley fill about 20 ft. deep, so that the apron of the overflow section had to be put down to this level.

The total head from the crest of the overflow section to the bottom of this apron is 42 ft. The total distance from the upstream face of the weir to the end of the reinforced-concrete apron is 128 ft. This apron varies in thickness from 3 ft. to 1 ft. at its lower limit. Cross-drains 8 in. in diameter were placed under the apron at intervals of 100 ft.

The apron below the overflow section near where the break occurred has been uplifted and broken, apparently from hydrostatic pressure from below. The existence of porous strata beneath the foundations and beneath the bottom of the sheetpiling in the valley fill, together with the raised and broken character of the apron near where the break occurred, indicates the existence of an uplift transferred from the water levels in the reservoir beneath the apron despite the presence of the drains and sheetpiling. Possibly this uplift was accentuated by the fact that there was a row of steel sheetpiling at the downstream edge of the apron. It is quite reasonable to conceive of water pressure, conveyed through the porous strata underneath the overflow section, exerting pressures on the bottom of the apron, which, as has been stated, was put in an excavation some 22 ft. deep, and that these pressures may have been extended over a broad area at the bottom of the apron, producing a condition somewhat resembling that of a large hydraulic jack.

If the distance that would have to be traveled by water percolating under the overflow section is increased by twice the length of the 30-ft. steel piling and twice the length of the 16-ft. piling at the end of the overflow apron, the total length of percolation under the weir would be 210 ft. and the ratio of head to length of percolation would be 5 to 1. If, however, such credit is not given to the interference of the piling, the ratio becomes but 3 to 1. Bligh in his "Practical Design of Irrigation Works" states that the safe ratio of head to length of percolation to prevent "piping" under weirs built on sandy foundations should be as follows:

> The thickness—i.e., the weight—of the apron or floor must be such that it will be safe from being blown up or fractured by the hydrostatic pressure. And its base length, or that of the enforced percolation (L), must not be less than $c \times H$, or than the product of the coefficient c with the head H.
>
> The following values of c have been adopted for the classes of sand detailed below, the derivation of which will be explained later:
>
> Class I. Riverbeds of light silt and mud, as the Nile, $c = 18$.
>
> Class II. Fine micaceous sand, as in Himalayan rivers and such as the Colorado in the United States, $c = 15$.

When the apron of La Fruta Dam was uplifted and broken by hydrostatic pressure it shortened the ratio of head to length of percolation and thereby accentuated this deficiency. It will be noted that these ratios in the case of La Fruta Dam were far less than prescribed by Bligh. It has been found by the writer that it is desirable to make the downstream toe of weirs and of earthen dams, where they are located on pervious bottoms, of large broken rock so as to permit of both underdrainage and flexibility.

It is realized that it is relatively very easy to cricitise a failure. This memorandum is presented not from the spirit of such criticism but in order to aid in a determination of a lesson to be gained from a costly failure.

J. B. LIPPINCOTT,
Consulting Engineer.

Los Angeles, Calif.,
June 30, 1931.

A Statement Made in Error

Sir—On p. 778 of your issue of May 7, 1931, there appears a news item entitled "Ames Again Highway Engineer of North Carolina." A statement is made as follows: "Mr. Ames was chief highway engineer of North Carolina from 1919 to 1929, when he resigned to become state highway engineer of Louisiana."

I am sure you will agree with me that this is an error, and I believe should be corrected in your columns. As you know, Charles M. Upham was state highway engineer of North Carolina from 1921 to 1926, and it was through his organizing and executive ability that a substantial highway organization was formed and economical expenditures of large funds were made.

C. N. CONNER,
Engineer-Executive,
American Road Builders' Association.

Washington, D. C.,
July 1, 1931.

◆

"Pretest" Piles Are Patented

In the article "Heavy Building Underpinning, Nassau-Broad St. Subway," appearing in *ENR*, July 2, 1931, p. 10, it should have been stated that the method of installing the piling described is patented by Spencer, White & Prentis, Inc.

A Misleading Caption

In the May 21, 1931, issue of *Engineering News-Record*, p. 864, a caption reading "Failure of a 60-in. steel water main in Pittsburgh" is used to describe two photographs showing a large hole in the ground, apparently caused by the failure in question. The caption is misleading, as it has since been learned that the holes are merely excavations made by the waterworks department in order to uncover a small puncture (1x1½ in.) in the bottom of the pipe caused by soil corrosion, the pipe having been laid in a cinder bank. The pipe was installed in 1895. After repair, consisting of welding a steel plate on the inside of the pipe directly over the break, the water was again turned on. An 85-lb. pressure is maintained in this main.

NEWS OF THE WEEK

E. J. Mehren Chosen Head of Portland Cement Association

ANNOUNCEMENT was made on July 20 by Frank H. Smith, chairman of the board of the Portland Cement Association, that Edward J. Mehren, vice-president of the McGraw-Hill Publishing Company, Inc., had been elected president of the association and will devote his whole time to the position. By this action two precedents of long standing have been broken by the association. The first is the election of a president outside of the industry, and the second is making the presidency a full-time position. Heretofore the leader of the association has been a president of one of the portland cement-manufacturing companies. During his term of office he not only has guided the work of the association but has also continued to operate his own company. The duties of the president have become so heavy, however, that the industry felt it unfair to continue this burden upon the president of any one of its member companies. Mr. Mehren has resigned his position with the McGraw-Hill company and will assume his new duties on Sept. 1.

Mr. Mehren's career in engineering and publishing, extending over a period of 24 years, is well known to all members of the profession. Born in Chicago, after his graduation from the University of Illinois in 1906 he entered the employ of the Chicago, Milwaukee & Puget Sound Railway. In 1907 he became associate editor of *The Engineering Record*, but left that work in 1911 to become secretary and manager of the Emerson Company, consulting engineers in management. After fifteen months he rejoined *The Engineering Record* as editor in the fall of 1912. When *Engineering News* and *The Engineering Record* were merged in 1918, Mr. Mehren became editor of the consolidated *Engineering News-Record*. At the same time he was elected vice-president of the McGraw-Hill Publishing Company and in 1921 he also became chairman of the editorial board.

In 1923 Mr. Mehren was promoted from the editorship of *Engineering News-Record* to the position of editorial director of the McGraw-Hill company. In 1929, on the absorption by the McGraw-Hill company of the publications of the A. W. Shaw company, of Chicago, Mr. Mehren was transferred to Chicago as resident vice-president in charge of the magazines published in that city.

As editor of *The Engineering Record* and *Engineering News-Record* Mr.

(Continued on page 152)

Falsework Failure Wrecks Kentucky Highway Span

Three workmen were killed and one was seriously injured when a 360-ft through-truss span of a new state highway toll bridge near Spottsville, Ky., crashed into the Green River on July 8. According to a wired report from H. D. Palmore, state highway engineer of Kentucky, one half of the span had been erected when the falsework failed. The killed and injured are said to have been working on the underside of the structure. Other workmen jumped clear of the wreckage. The injured man is reported to have said that he had been sent to repair the falsework, which was "slipping"; that this slipping was found to be increasing; but that before all men could be warned off the span, it crashed.

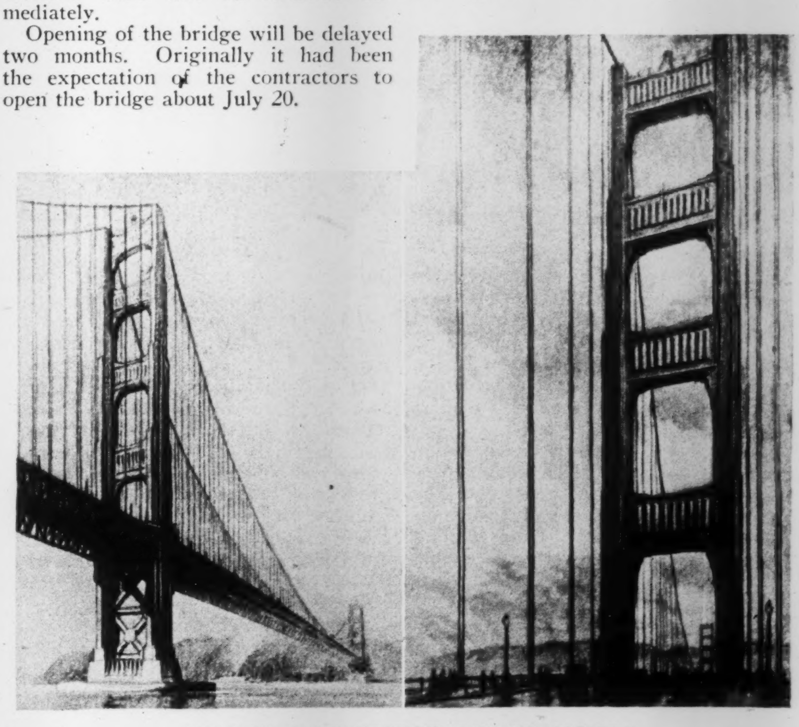
One through-truss had already been completed and work was under way on the second when it crashed. The loss is estimated at about $40,000. The contractor is the International Steel & Iron Co., and steel erection was sublet to William Ghormley, Evansville. The wrecked span is being removed and erection work will be resumed immediately.

Opening of the bridge will be delayed two months. Originally it had been the expectation of the contractors to open the bridge about July 20.

Optional Contracts to Low Bidders on Golden Gate Bridge

A CONDITIONAL offer for the first block of Golden Gate Bridge bonds totaling $6,000,000, made by a San Francisco banking and investment syndicate, was accepted by the directors of the Golden Gate Bridge and Highway District at a meeting held July 16. The syndicate receiving the bid is managed by Bankamerica Company and includes R. H. Moulton & Co. and the American Securities Co. The conditions of the offer are to purchase the first $6,000,000 block of bridge bonds at a premium of $7,500, contingent upon a state supreme court decision giving final validation to the issue. The bid also includes the optional right to take an additional $9,000,000 of the bonds at a premium of $102,000 within five months after the state supreme court renders its decision on the tax feature.

The question to be ruled on by the supreme court is the right of the district to tax the counties comprising it



GOLDEN GATE BRIDGE, SAN FRANCISCO

Architectural renderings of proposed Golden Gate Bridge, showing unique tower design, without crossbracing above the roadway. Struts between tower legs are sheathed in copper-bearing sheet steel. The main span of the bridge is to be 4,200 ft. long. Contracts have been let conditional on a court decision approving the right of the benefit district to levy taxes on real estate on the Golden Gate Bridge and Highway District, including the city of San Francisco.

to meet bond interest and retirement of payments in the event the bridge revenues are insufficient to meet those charges. Immediate steps were taken at this meeting to bring the tax question before the supreme court through a mandamus proceeding, with the possibility that decision might be obtained within a few weeks.

Optional contracts for the major construction features of the bridge were awarded to the low bidders. The low bidders agreed to a six months' delay in starting work, and the optional contracts provide that the bridge district will award definite contracts if and when the $6,000,000 bond issue is sold or contracted to be sold within the six months' period.

The awarding of optional contracts was necessary to avoid the rejection of all bids, as the checks deposited by the bidders expired July 17. The definite contracts cannot be awarded until the bonds are sold or contracted to be sold, and this action must await the state supreme court decision.

The low bidders receiving the optional contracts are: McClintic-Marshall Corp., $10,494,000, steel superstructure; American Cable Co., $6,255,767, cable construction and erection: Pacific Bridge Corp., Portland, $2,260,000, two main piers; Barrett & Hilp, $1,645,841, anchorages, minor piers, cable housing, filling and grading; Columbia Steel Corp., $996,000, both approach spans; Granfield, Farrar & Carlin, $67,587, Marin County approach roads. All bids for the San Francisco approach road, paving main span and approaches, and toll houses and buildings, Barrett & Hilp being the low bidder on these, were rejected.

◆

$10,000,000 Illinois Road Work Delayed by Prevailing-Wage Law

New highway work in Illinois totaling $10,000,000 will be delayed from six to eight weeks because of the state prevailing-wage law, which went into effect July 1, it is estimated by Frank T. Sheets, state highway engineer. The full effect of the law cannot be determined until the attorney general renders a formal opinion.

No delay is expected in Wisconsin on account of a similar law, because of a ruling by the attorney general to the effect that until the state industrial commission has advised what the prevailing rates are, contracts will be awarded and work let as heretofore.

◆

Lachine, Que., to Have 6,600,000-Gal. Filtration Plant

Rapid progress is being made on the construction of a 6,660,000-gal. filtration plant, costing $400,000, at Lachine, Que., and the equipment will be put into place by the middle of November. The foundations, settling tanks and filters are of concrete, and the walls of brick and stone.

Mehren Heads P.C.A.

(Continued from page 151)

Mehren introduced new conceptions of modern journalism into the field of technical publishing, and through his keen appreciation of news and his mastery of the editorial pen worked powerfully to advance the construction arts. Aside from his constant close concern with engineering, he took specially active interest in the correlation of engineering and construction. One of his greatest interests was the development of the modern road system; he made an intensive study of highway problems and through his paper influenced much of the advance in highway policy and practice. He played an important part in the formation of the Associated General Contractors. He also was a leader in the modernization movements within the American Society of Civil Engineers.

Edward J. Mehren

The activities of Mr. Mehren have not been confined to publishing. He took a leading part in the work of many public bodies. In particular as chairman of the Highway Safety Committee and of technical simplification committees he performed public service of lasting value. He took a prominent part in the New York Building Congress and is the father of its craftsmanship award system. He has been a director of the American Road Builders' Association, a member of the committee on highways and motor transport of the United States Chamber of Commerce and chairman of the marketing problems committee of the Illinois Manufacturers Association.

Mr. Mehren has spoken and written extensively on subjects within the field of engineering, industry and business. He is the author of a series of papers on industrial conditions in Europe, based on his studies abroad and his observations at the World Economic Conference in Geneva and the meeting in 1927 of the International Chamber of Commerce at Stockholm.

Wage Cuts by Contractors Tie Up Westchester County Work

Labor trouble, precipitated by attempts of contractors to lower wages, has tied up much of the large construction program of state, county and municipal work in Westchester County, N. Y., in and around White Plains. All the work affected is highway construction, with the exception of one or two small sewer jobs. Efforts to establish a wage scale satisfactory to both sides have failed so far.

On July 10 several local contractors announced a cut in base pay of laborers from 50c., which has been paid by them all this year and most of last year, to 45c. and 40c. These contractors claim they were forced into the cuts by two out-of-state firms which had come into the county about six months previously and established the lower scales on their work. Many of the workers struck against the reduction. Labor agitators soon had them demanding $5 for eight hours and recognition of a newly formed construction laborers' association. The New York state labor law provides for the payment of prevailing wages on public works except for state highway work outside of any town limits.

On July 17, at a conference of state, county and municipal engineers, contractors and representatives of labor, a 50c. rate was agreed as prevailing. Seventeen contractors agreed to pay this rate, but the strikers refused to accept it, overruling their representatives. Previously the workers had refused an offer of $5 for nine hours. Some contractors are importing labor, paying 40c. to 50c. in an effort to continue work. Considerable fighting and rioting have accompanied the striking.

◆

H. E. Miller Gets Position in U. S. Public Health Service

In order to facilitate its emergency sanitation work in the drought area, the U. S. Public Health Service has appointed H. E. Miller, formerly of the North Carolina board of health, as supervising rural sanitation engineer. The purpose of this work is to render advice and assistance to localities in the drought area that are confronted with emergency sanitary problems in home water supply or sewage disposal.

Mr. Miller has accepted the appointment. As the position that he will fill is a new one and was created for the express purpose of supervising emergency work during the period in which conditions were upset as a result of the drought, it is not known as yet whether or not the work can be continued permanently. Congress appropriated $2,000,000 to be used by the Public Health Service in rural sanitation work in the drought area for a sixteen-month period ending June 30, 1932. It is believed, however, that the type of service to be rendered through Mr. Miller's activities will meet with such approval that means will be found to continue it.

Pennsylvania R.R. Tunnel in Baltimore Soon to Be Started

The improvement program of the Pennsylvania Railroad in Baltimore received further impetus last week with the award of a contract to the Arundel Corporation to begin work at once on widening the railroad's Broadway bridge to increase its Baltimore trackage and with the award of another contract to the Empire Construction Co. to start work immediately on the raising of the Pennsylvania's tracks between Franklin St. and Gwynn's Falls. It is also announced that construction of the 3,400-ft. tunnel from Bond St. to Greenmount Ave. will begin late next month and is expected to be completed by Dec. 31, 1932.

All the railroad's grade crossings in Baltimore are to be eliminated under an agreement entered into with the city in June, 1929. The entire grade-crossing elimination program will cost, it is estimated, in the neighborhood of $1,000,000, the city sharing the expense equally with the railroad.

The Pennsylvania's improvement program entails construction of two new four-track tunnels, paralleling the present two-track tunnels, east and west of Pennsylvania Station. It also involves reconstruction of Calvert station, the building of new warehouses adjacent thereto, and complete electrification of the company's lines through the city.

The electrification project in Baltimore alone is expected to cost between $7,500,000 and $12,000,000.

◆

West Coast State Highway Officials Discuss Problems

One hundred and fifteen delegates attended the annual meeting of the Western Association of State Highway Officials in San Francisco July 10-11. The association comprises the states of Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, Washington and Wyoming.

In the morning of the first day addresses were made by Henry H. Blood, chairman of state road commission, Utah, and C. H. Purcell, state highway engineer, California. Mr. Blood spoke on "National Legislation," emphasizing the necessity for increased expenditures by the federal government for roadbuilding within the public domain. Mr. Purcell in his address said that the two most vital issues facing the state highway engineer today are the orderly addition of new roads to the state highway and the prevention of diversion of state highway funds.

In the afternoon S. B. Show, regional forester, U. S. Forest Service, gave an address on "Rights-of-Way Through National Forests and Preservation of Roadside Scenery." C. S. Pope, construction engineer, California division of highways, discussed "Pavement Construction in 1930: Portland Cement Concrete and Asphalt Concrete."

Addresses on Saturday included: "Report of Construction Progress in Western States Under Recent Federal Appropriations," by L. I. Hewes, deputy chief engineer, U. S. Bureau of Public Roads; and "Oiled Road Construction," by T. H. Dennis, maintenance engineer, California division of highways.

At the business session the following officers were elected: president, Z. E. Sevison, Wyoming; vice-president, O. S. Warden, Montana; secretary, Preston G. Peterson, Utah.

◆

Faster Progress and Lower Costs in Mississippi River Work

Three years' operations on the flood-control project for the Mississippi River were completed on June 30, 1931. The money appropriated as of that date was $127,000,000, obligated and remaining as follows:

Obligated by contracts and hired labor	$122,000,000
Reserved for court awards for right-of-way, flowage, etc	3,500,000
Held for contingencies	1,500,000
Total	$127,000,000

The total yardage placed in levees was as follows:

	Cu.Yd.
1929	23,000,000
1930	43,000,000
1931	92,000,000
Total	158,000,000

In addition to the increasing rate of progress shown by these figures, improvement in methods, contractors' organization and equipment and the decreased cost of materials and labor are indicated by the following comparison of unit costs of the work completed, contracted for, authorized by hired labor, etc:

Year	Cu.Yd.	Cents Per Cu.Yd.
1929	28,930,000	26.989
1930	90,000,000*	23.809
1931	86,660,000	20.601

*Includes contracts extending into 1931 and 1932.

These unit prices include all charges except deferred overhead, which will be distributed uniformly on completion of the project. This should not amount to more than ½c. per cubic yard.

The Business Outlook

While the European situation continues to contribute to the uncertainty of the stock and commodity markets, the post-holiday figures of general trade and production indicate slight improvement in some lines. Steel production, while still at low levels, made a fair recovery from the holiday drop. Coal and electric power output moved upward. Carloadings declined less than usual over the July 4 week-end. Check payments and commercial loans are holding up fairly well. Declines in wheat, corn, cotton and copper prices continue, while steel prices reveal mixed trends.

—The Business Week, July 22

Deficiency of Rainfall in Southeastern States

Special Correspondence

Accumulated precipitation deficiencies since early last spring over a considerable part of the Southeast have not been greatly relieved by the showery weather in that section since July 15. Even with a maximum of nearly 8 in. for 24 hours at Mobile and numerous heavy falls at various other points, there has been no widespread precipitation. Moreover, past records indicate that there is not likely to be until early winter. Of course, great summer floods have occurred in that region, notably those of July, 1916, and August, 1928. But these were exceptional, and engineers and officials in charge of works dependent on normal streamflows are not counting on their repetition this year.

Present deficiencies are the most marked over much of Georgia, northern Alabama and eastern Tennessee. The Carolinas have fared better, with Virginia in fairly good shape. But in none of this territory, except probably in the latter state, have groundwater reserves, depleted by several years of subnormal percolation, been fully restored.

Given the normal fairly heavy rainfall of the affected section for the remainder of the summer, there is limited hope for early relief, since superficial evaporation and plant transpiration are high under the climatic conditions that obtain. Precipitation from the end of August to early winter ordinarily also is the least of the year. Hence, industrial and municipal water supplies may readily feel the pinch in the next few months. Reservoir levels of hydro-electric developments that have been falling for several weeks are unlikely to begin to rise again until after the turn of the year. So it would appear that 1930 and 1931 may furnish need for revision of many previous minimum records for streamflows for two consecutive years.

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Men Trapped in Tunnel Freed

Eleven men trapped in a flooded pipe tunnel at Milwaukee, Wis., on July 19 were found safe within the air chamber at the headings when the flooded tunnel was pumped out. The tunnel was being built by the Milwaukee Electric Railway & Light Co. for steam heating pipes. The shaft was located at the foot of a hill where water coming down the hill during a downpour of rain backed up on the pavement, rose over the sidewalk and poured into the shaft of the tunnel carrying away the small dike built around it to keep out surface water. When the men working in the tunnel discovered the water pouring down the shaft they took refuge behind the air locks and remained there until released about six hours later by the firemen, who pumped the water out of the tunnel. A dam of clay and timber has now been built around the shaft head to protect it in case of a similar emergency.

Hoover Dam Notes

With the temperature ranging from 110 to 116 deg., work in connection with the Hoover Dam was carried forward under difficulties during the week ended July 14. The recording thermometer in the canyon shows temperatures as high as 126 deg. Despite this fact work has continued on most jobs without interruption. It has been necessary in two or three instances to work at night instead of during daylight hours.

A meeting of the Colorado River Board will be held next month to consider some of the tests that have been made, particularly the model tests on spillway structures in progress at Fort Collins and at Montrose. Tests on Arizona concrete are continuing at Las Vegas. High-velocity tests are being made at Guernsey. One block will be selected for a long-time test to develop the effect of velocity only. At Denver work is in progress in the concrete laboratories on the technique of various tests. An outline of research studies is being made. A number of preliminary tests for concrete constants have been made.

Power became available in Boulder City July 9. Since that date sub-station operation has been continuous.

Three shifts daily are at work on the railroad along the Nevada cliff. Rapid progress is being made on the line through the three-way junction and on the line to the gravel pit. Two shovels are at work at the outlet of the Nevada tunnels. The portal for the inner tunnel has been established; the face has been squared at the outlet of the Arizona outer tunnel. Wide-gage tracks have been installed in the outlet of the inner Arizona tunnel and in the Arizona adit. Mucking machines already are at work. The total amount of 12x12-ft. tunnel which had been driven up to July 14 is as follows: Nevada inner tunnel 104 ft. downstream from the adit and 89 ft. upstream; Arizona inner tunnel 158 ft. downstream and 123 ft. upstream; from the outlet of the Arizona inner tunnel 100 ft.

Stripping the canyon wall above the intake portals of the Arizona tunnels began July 10. Excavation for the hospital building at Boulder City has begun. Work is continuing on the Black Canyon highway.

After careful checking, 295 applications for business permits in Boulder City have been classed as bona fide. The applicants have their residences in 36 states and represent 62 types of business enterprises.

The bid of the New Mexico Construction Co. for various town improvements was sent to Washington July 13 with a favorable recommendation. Consideration is being given zoning regulations and a building code is being drawn up.

Some 30,000 lin. ft. of pipe for the water system has been laid. Two shifts are working on the presedimentation basin. Final designs for the water-treating plant and the sewage-disposal plant have been completed.

The electrical distribution system in Boulder City will be constructed by government forces. This decision was made so that the work could be coordinated with other construction in progress.

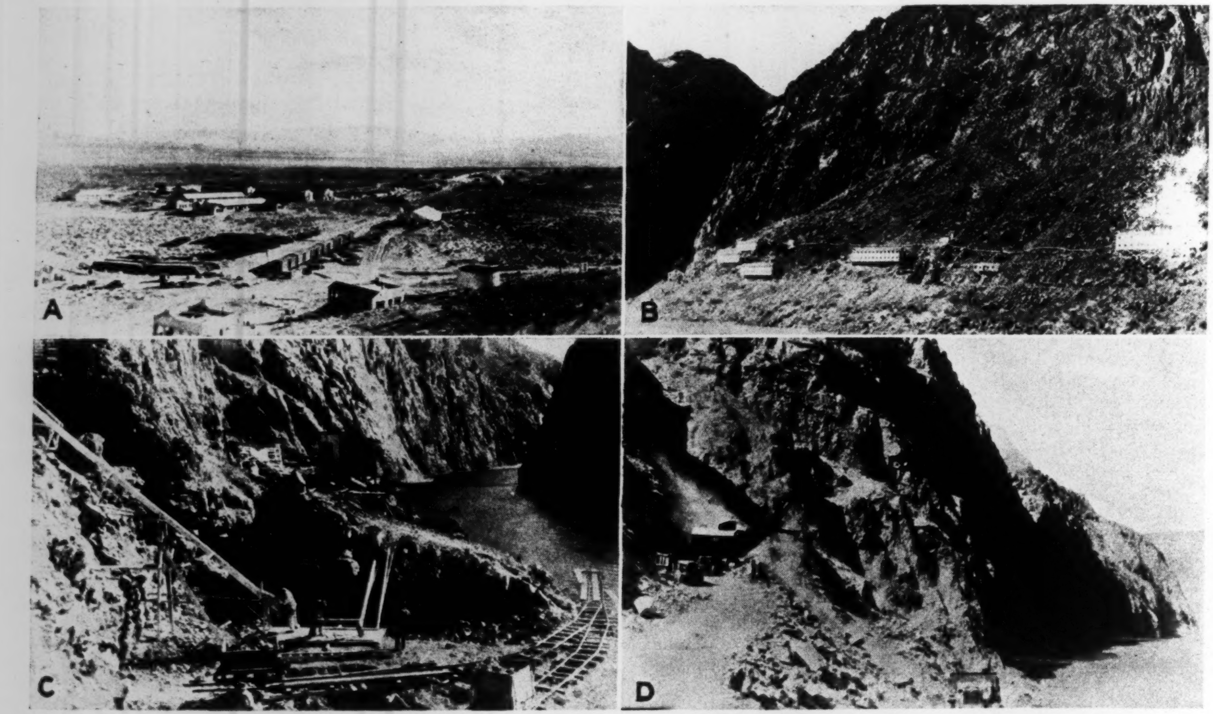
Four tunnels for the Boulder City-Hoover Dam railroad have been completed. Borings in the fifth tunnel indicated that it will have to be timbered. Enough track has been laid to permit a work train to operate.

Completion of the Boulder City-Hoover Dam highway was scheduled for July 18. The work required ten days longer than the period designated in the contract.

◆

Engineer Selected for Shushan Airport, New Orleans

The National Airport Engineering Co., Ltd., of Los Angeles, Omaha and Cleveland, has been selected as engineer for the Shushan airport in New Orleans, which, when completed, will cost $10,000,000. The initial development will cost $1,500,000. Preliminary surveys and aerial photographic work have been completed and actual construction of 2 miles of concrete bulkhead is now under way.



FOUR POINTS OF INTEREST AT HOOVER DAM TODAY

(A) General view of Boulder City. Water-supply tank and government administration buildings are shown in foreground. (B) Six Companies camp at bottom of Black Canyon above dam site. Six 80-man bunkhouses and a mess hall are subject to the terrific heat of the canyon depths without benefit of possible cooling breezes that may blow across the rims high above. (C) Site of the intake to Boulder City's water supply. Water will be pumped from this point against a head of 2,000 ft. Dam will be located in narrowest part of canyon in background. (D) One of the new 2¼-yd. electric shovels cutting a road along the side of the canyon to the lower portals of the Nevada diversion tunnels.

Elizabeth, N. J., Acquires Water-Distribution System

On July 15 the city of Elizabeth, N. J., began the municipal operation of a water-distribution system. On that day the city purchased the system of the Elizabethtown Water Co. for $3,998,277 and that of the Plainfield-Union Water Co. for $275,000. In future the supply of water for the city-owned distribution system will be obtained from these two companies and from the city of Newark. The amounts to be obtained from each of the three sources has not yet been definitely decided upon, but roughly they will amount to 4.5 m.g.d. from the Elizabethtown company, 0.5 m.g.d. from the Plainfield-Union company and 5 m.g.d. from the city of Newark, according to S. F. Newkirk, Jr., engineer and superintendent.

◆

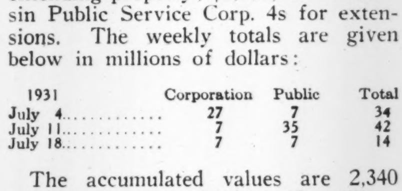
Capital and Contracts

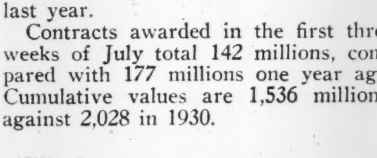
Capital has been issued thus far this month at the rate of only 30 millions per week, compared with 142 millions in July, 1930. The principal issues were $2,500,000 Cleveland 4s and 4½s for sewage disposal and paving; $1,747,000 Kearny, N. J., 4½s for library, school, and street improvement; $4,000,000 Wisconsin Valley Electric Co. 4½s for extending property; $2,500,000 Wisconsin Public Service Corp. 4s for extensions. The weekly totals are given below in millions of dollars:

1931	Corporation	Public	Total
July 4	27	7	34
July 11	7	35	42
July 18	7	7	14

The accumulated values are 2,340 millions this year, against 4,454 millions last year.

Contracts awarded in the first three weeks of July total 142 millions, compared with 177 millions one year ago. Cumulative values are 1,536 millions, against 2,028 in 1930.





COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume		
July 1,	**1931**	**174.37**	**June,**	**1931**	**243**
June 1,	1931	187.37	May,	1931	251
July 1,	1930	200.95	June,	1930	324
Average,	1930	202.85	Average,	1930	260
Average,	1929	207.02	Average,	1929	317
1913	....	100.00	1913	....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of July 23, with some comparisons, total as follows:

(In Thousands of Dollars)

Buildings:	July 23, 1931	Average of Last Four Weeks 1931	Average of Last Four Weeks 1930
Industrial	$26,919	$9,100	$7,992
Other	20,943	16,814	18,014
Streets and roads.	5,871	10,049	14,888
Other construction.	32,811	21,100	12,749
Total	$86,544	$57,064	$53,645

Total, all classes, Jan. 1 to July 23:

1931	$1,622,403
1930	2,065,404

Booker Succeeds Miller in North Carolina Health Department

Warren H. Booker, of Charlotte, has been appointed by the North Carolina state board of health to succeed H. E. Miller, who for many years was director of the board's bureau of engineering and inspection and who was recently dismissed in a reorganization of the department.

Mr. Booker, who is a graduate in civil engineering of the Ohio State University, was engineer assistant, Ohio state board of health, in 1908 and 1909, reporting on waterworks and sewer systems for small towns. From 1909 to 1911 he was with the United Fuel Gas Co., part of the time as chief engineer. From 1911 to 1918 he was chief of the bureau of engineering and education for the North Carolina state board of health, engaged in examinations of water supplies and sewer systems and in charge of all educational work of the board. In 1918 and 1919 he was in France in the interests of an educational campaign for the prevention of tuberculosis sponsored by the Rockefeller Foundation. Since then he has been engaged in consulting practice in Charlotte.

◆

Work Started on Pressure Tunnel Under Vancouver Harbor

The Northern Construction Co. and J. W. Stewart, Vancouver, British Columbia, have started work on the pressure tunnel under the First Narrows, entrance to Vancouver harbor, which is an integral part of the water supply of the Greater Vancouver district. The project is estimated to cost $1,000,000. Two shafts, 400 and 500 ft. deep, will be sunk on the north and south shores. They will be connected by the 3,100-ft. tunnel in the solid rock underlying the approach to the harbor.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Narrow Floodway for Mississippi Under Study—Early Beginning of Dotsero Cutoff Is Assured

THE special study being made by the Mississippi River Commission of a narrower west bank floodway than had been contemplated in the other plans is proceeding rapidly. Dredging a pilot channel 100 ft. wide and 30 ft. deep along the low point of the Boeuf and Atchafalaya basins is being considered. Data collected thus far indicate that the constant flow of water through the original cut would enlarge it gradually to the point where it could be relied upon to carry the full diversion that would be necessary in the event of a superflood. The constant flow would be maintained by placing a control gate in the concrete sills that would be installed at the heads of the Boeuf and Atchafalaya floodways. In time of unusual floods the water would pass over the sills into a well-protected basin. The board of state engineers for Louisiana is cooperating in the study.

In his report to Congress last session Gen. Brown expressed the opinion that an ultimate solution to the flood problem cannot be reached until provision is made for a narrow floodway. No specific plans for narrowing the floodways were included in the report, however.

Dotsero Cutoff Assured

Formal notification by the Denver & Rio Grande Western of acceptance of conditions made by the Interstate Commerce Commission regarding acquisition of the Denver & Salt Lake assures early commencement of construction of the Dotsero cutoff. It is reported that surveyors are already on the ground along the 42-mile project that will cost approximately $3,500,000. The D. & R.G.W. filed with the commission July 18 a copy of its agreement with the Denver & Salt Lake whereby it will purchase for cash at $155 a share any Salt Lake stock that minority holders may offer within six months. It is also agreed that the D. & R.G.W., through the Salt Lake, will establish such through routes with any western connection hereafter built as the commission may specify. The commission was assured that construction will commence as soon as authorized and that it will be completed within two years.

Amendment to Be Sought to Bacon-Davis Law

After observing the functioning of the Bacon-Davis prevailing-wage law, government contracting officers have indicated that they are not entirely satisfied with results and it is probable that an amendment to make the law more workable will be sought during the next session of Congress. The feeling exists among departmental officials that much uncertainty and delay would be prevented if the rates that the contractors are required to pay for their labor could be ascertained beforehand and published in the specification for the work.

Both declining material prices and increased competition among contractors have tended to result in lower bids. While it is agreed that bids would be still lower were it not for the Bacon-Davis law, the effect cannot be determined with exactitude. It is significant that no disputes have been referred to the secretary of labor. Such disputes as there have been apparently have been compromised.

Barge Line Paying

Because of the desire of large industrial shippers to cut their transportation costs, much traffic that formerly was routed over the railroads is being diverted to the government's Mississippi barge line. As a result the earnings of the Inland Waterways Corporation show an upward trend. An operating report made public last week shows that the first five months of 1931 were the most profitable since the barge line was started. After deducting all expenses and depreciation charges, the net income for these months amounted to $97,489. For the same period of 1930 a deficit of $29,450 was reported.

The recently inaugurated service on the Illinois River is being used by shippers to such an extent that it has paid for itself from the outset. This was something of a surprise to operating officials, who had expected that the service would not be self-sustaining for several months.

◆

Chicago Plans New Terminals

A new step in Chicago's complicated and protracted problem of railway terminal revision is the presentation to the city council, by its committee on railway terminals, of a plan prepared by Edward J. Noonan as consulting engineer for the committee. This plan, which was prepared independently of the railroads, provides for two south-side terminals for fifteen railroads now using four old stations. One of these would be on the lakefront, at practically the site of the present Illinois Central station, and the other near the present La Salle St. station. With the straightening of the river, now completed, new streets are to be opened south from the business district, but they are blocked by railway property, and some definite plan of terminal facilities is necessary before the street layout can be determined. The railroads have had the subject under consideration for several years but have been unable to agree among themselves and have been inactive also on account of financial conditions. In view of this situation and the need of additional north-south thoroughfares the council committee undertook to prepare its own plan, the cost of which is estimated at $25,000,000.

Personal Notes

Robert L. McNamee has been made a member of the engineering firm of Hoad, Decker, Shoecraft & Drury, of Ann Arbor, Mich., on whose engineering staff he has been almost continuously since 1919. The firm intends to expand its field to cover several fields of municipal work not formerly cultivated.

Earle H. Morris, for the past eleven years chief engineer for the board of railroad commissioners of the State of North Dakota at Bismarck, has been appointed chief engineer of the public Service Commission of West Virginia, with headquarters at Charleston. Prior to the North Dakota tour of duty Mr. Morris was on the engineering staff of the Indiana Public Service Commission.

Arno Carl Fieldner, chief engineer, experiment stations division, U. S. Bureau of Mines, and **Charles Edward Skinner**, assistant director of engineering, Westinghouse Electric & Mfg. Co., have been awarded the Lamme medal by the Ohio State University. This medal, which is given to a graduate of one of the technical departments of the university for meritorious achievement in engineering, is one of a group endowed by Benjamin G. Lamme, late chief engineer of the Westinghouse Electric & Mfg. Co.

M. A. Timlin has recently joined the organization of E. L. Conwell & Co., Philadelphia, Pa., as engineer of tests. Mr. Timlin was previously testing engineer in charge of the Turner Construction Co. laboratory in New York. He has been connected with concrete work for a number of years and has handled the testing on a number of large projects, including the James River bridge at Newport News, Va., and the Conowingo Dam in Maryland.

Charles R. Bettes, chief engineer of the Long Island Water Corp. and actively connected with that water system since 1893, has resigned to enjoy a rest following a practice of engineering that started in 1883.

Harry L. Kinsel has resigned as engineering assistant in the Philadelphia office of the Pennsylvania state department of health to accept a position as assistant engineer for the village of Mamaroneck, N. Y.

SOCIETY CALENDAR

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington; annual meeting, Sept. 28-Oct. 1, Salt Lake City.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York; annual convention, Montreal, Sept. 14-17.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; fall meeting, St. Paul, Minn., Oct. 7-9.

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS, St. Louis; meeting, Oct. 19-26, Pittsburgh.

AMERICAN WELDING SOCIETY, New York City; fall meeting, Oct. 21-25, Boston.

INTERNATIONAL CITY MANAGERS ASSOCIATION, Chicago; annual meeting, Oct. 7-10, Louisville, Ky.

INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Chicago; conference, Sept. 24-26, New York City.

NATIONAL MUNICIPAL LEAGUE, New York City; annual meeting, Nov. 9-11, Buffalo, N. Y.

NATIONAL SAFETY COUNCIL, New York City; twentieth annual safety congress, Chicago, Oct. 12-16.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston; annual convention, Sept. 29-Oct. 2, Boston.

INSTITUTE OF MAKERS OF EXPLOSIVES held a meeting in Atlantic City July 9-10 at which the member companies agreed on release forms which customers will be asked to sign when blasts are supervised by the field men of explosives manufacturing companies.

NIAGARA FRONTIER CHAPTER, Association of General Contractors of America, held a dinner in Buffalo on July 17, at which A. P. Greensfelder, of St. Louis, national president, gave an informal talk pointing out the major problems of contractors and what the national association is doing to solve them. Edward J. Harding, Washington, D. C., managing director of the national association, gave a talk advocating prequalification of contractors.

Obituary

Truman P. Gaylord, vice-president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., died suddenly on July 5 in Shelby, Mich., his boyhood home, where he was visiting his mother. He was 60 years old.

Walter Hunter Whiteside, Pacific Coast representative of the Westinghouse Electric & Mfg. Co. until his retirement from active business six years ago, died suddenly from a heart attack on July 17 at his home in Pasadena, Calif. He was 70 years old. From 1904 to 1911 Mr. Whiteside was president of the Allis-Chalmers Co., of New York.

Silas P. Tomkins, who was 100 years old on Jan. 30, died on July 20 at his home in Matawan, N. J. Mr. Tomkins, who was a self-educated civil engineer, made a survey in 1851 for the Morris & Essex Railroad from Dover to Hackettstown and later to Phillipsburg. Forty-eight years ago he built the magazines for the United States government at Piccatinny.

Andrew Lanquist, general contractor, died in Chicago on July 10 after a long illness. Mr. Lanquist was the first active president of the National Association of Building Trades Employers' having been elected at the first annual meeting at Indianapolis Jan. 12, 1920. Mr. Lanquist helped to organize the Associated Building Contractors of Illinois and served as its president several years. He also served five terms as president of the Builders Association of Chicago and had been president of the Associated Builders of Chicago.

Construction Equipment and Materials

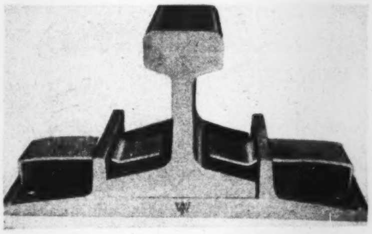
Seek Uniform Valve Markings

Difficulties and occasional accidents resulting from non-uniform markings, or no markings at all, on valves and fittings have prompted the National Association of Purchasing Agents to establish a committee whose object will be to develop uniform markings and promote their general adoption by manufacturers. The work is under the chairmanship of E. H. Weaver, Union Oil Company of California, Seattle, Wash. In the oilfields particularly, where valves and fittings are used several times, lack of uniform markings becomes a serious problem. The difficulties arise from confusion as to pressures, some valves showing safe working pressures and others test pressures, while some show steam pressures and still others apply to oil, water and gas. The recent use of various alloys in valve manufacture adds another reason for confusion, for users cannot properly identify the valves when ordering new parts or replacements. The committee is inviting the cooperation of other outstanding organizations whose members are directly concerned with the problem. A survey of difficulties actually experienced is now in progress, the results of which will form the basis for a joint conference between manufacturers and users of valves and fittings.

◆

Spring Clips Used to Fasten Rail to Tie-Plate

A clip fastening for track rails which holds by spring action instead of by the rigid grip of a cut or screw spike is the main feature in a new track device of the Woodings Forge & Tool Co., Verona, Pa. A special form of tie-plate, $14\frac{3}{4}$x$7\frac{1}{2}$ in., is required, having on each side of the rail a high shoulder with slotted hole to receive the clip, which bears down on the rail base but has sufficient spring action to allow for wave motion in the rail. The clips or spring plates are L-shaped and about $2\frac{1}{2}$ in. wide. The longer horizontal leg passes through the slotted shoulder and rests on the rail base, while the shorter vertical leg bears against a small rib along the edge of the tie-plate. Either cut spikes or screw spikes may be used to fasten the plate to the tie, but they do not act as rail fastenings.



Spring-clip rail fastening

◆

Truck Body for Mixing or Agitating Concrete

A distinctive egg-shaped drum with twelve-sided panel design is a feature of the Smith truck mixer and agitator body announced by the National Equipment Corp., Milwaukee, Wis. The unusual shape of the drum gives a five-step mixing action without reversing the direction of rotation, and also provides for positive discharge of the contents without hoisting or tilting the drum, and with full control of discharge speed. The rotating section of the body is mounted on roller and ball bearings and is driven by a separate power unit. Two sizes are available, the smaller with a capacity of 1 cu.yd. as a mixer and $1\frac{1}{2}$ cu.yd. as an agitator; the larger with corresponding capacities of $2\frac{1}{2}$ and 3 cu.yd. A third model, with a capacity up to $4\frac{1}{2}$ cu.yd., will soon be available.

Concrete agitator-mixer body

◆

Dump Body Mounted on Tractor

Using the McCormick-Deering 10-20 tractor as a power unit, the Shunk Manufacturing Co., Bucyrus, Ohio, is marketing an automatic gravity tractor dump unit for use in earth-moving operations, particularly where excavating and loading are done with power shovels or elevating graders. This unit, which has a struck capacity of 3 cu.yd., or 5 cu.yd. with sideboards, can be obtained with crawler mounting or on steel or pneumatic tired wheels. Wheel and crawler equipment is interchangeable in the field. The body dumps by gravity, and is fitted with two spring-mounted chains to absorb the shock of dumping and with a hydraulic governor which checks the gravity return movement of the body, thus preventing any jar to the chassis. A heavy auxiliary axle of high-carbon steel fitted with Timken bearings carries the full load of the tractor, frame and pay load, thus relieving the driving axle of all duties except the transmission of power. Motor, transmission and differential are mounted on one continuous cast-iron bedplate. Easy operation in either direction is assured by a dual control arrangement with an operator's seat facing in each direction. The steering mechanism is designed for travel on rough ground, and operates easily. Through the use of a special front axle, a vertical oscillating movement of 14 in. is possible with the front wheels vertical at all times. As auxiliary equipment a bulldozer attachment can be obtained, operated from the driver's seat.

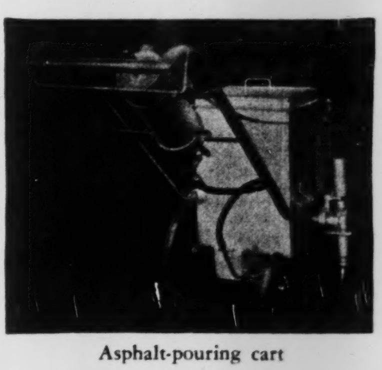
Tractor dump body combination

◆

Cart for Filling Joints

Scientifically designed for pouring hot asphalt in the joints of brick, block or concrete pavements, a hot asphalt pouring machine known as SavPav has been announced by the Dobbie Foundry & Machine Co., Niagara Falls, N. Y. Essential elements of the unit consist of a swinging inner tank heated by an oil burner, an outer or protection tank, a two-wheel carriage, a nozzle which discharges the hot liquid into the joints, connecting piping and control valves. For use on small block pavement an additional nozzle can be added so that two joints can be filled at one operation.

The unit is so balanced that the operator can control the elevation of the nozzle closely by merely changing the angle of inclination of the handlebars, at the same time regulating the rate of feed by a valve trigger on the handle. A small guide wheel in front of the nozzle does not carry any weight, but



Asphalt-pouring cart

is free to move in a vertical direction as the machine is tipped. A weight keeps the wheel pressed down into the crack or joint so that the nozzle follows its contour closely. The inner tank, to which the nozzle is attached, is free to swing for a short distance to the right or left, permitting the nozzle to move freely in response to the guide wheel.

In the standard unit a single burner is used, supplied with oil from a tank mounted on the handle. This burner can be removed and the flame directed against the hot asphalt valve when starting operations. After this has been sufficiently heated to enable the asphalt to flow freely, the burner is returned to the base of the outer tank, where it serves to keep the asphalt supply in a liquid state. Addition of a second burner in the base of this machine converts it to a melting tank as well as a pouring machine, making the use of a larger melting kettle unnecessary.

Auxiliary equipment is available for attaching a brush directly behind the hot asphalt nozzle, making it possible to paint a line on the pavement to serve as a traffic guide. The marking material used can be either hot asphalt or ordinary traffic paint.

◆

Traffic Signal Controlled by Magnetism

A traffic demand signal actuated by a magnetic coil buried under the paving has been perfected by the Miller Train Control Corp., Staunton, Va. By means of this device an uninterrupted flow of traffic is permitted through an arterial boulevard until pedestrians or vehicles approach the intersection from the side street. When the mechanism is put into operation by cross-traffic, automatic timing equipment is set in motion which, at the end of a predetermined cycle, will stop traffic on the main thoroughfare for a sufficient interval to permit vehicles from the side street to clear the intersection. After the signal indication has returned to green on the main street, it must remain in this position for a minimum period of time, during which it cannot be reversed by cross-traffic. This feature prevents undue interruption to the main street traffic flow.

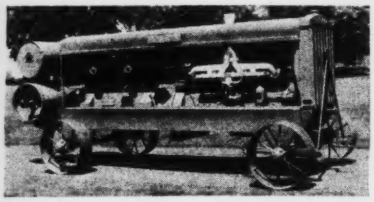
The detector unit, buried under the paving, is composed of two cores of laminated transformer steel, upon which four coils—two primary and two secondary—are imposed. The functioning parts are housed in a seasoned concrete structure protected by a manganese steel cover.

A primary magnet in the detector is connected through an underground cable to a source of alternating current. A secondary coil in the detector normally energizes a relay in the control cabinet. The iron and steel members of a vehicle in proximity to the detector attract the magnetic flux from the primary and redirect it from its normal lateral direction to a longitudinal direction. This reversal of magnetic flux deprives the secondary coil of its energy and allows the relay armature to drop on its back contact and causes the timer to perform its intended function of reversing the signal in accordance with the predetermined timing arrangement. When a pedestrian wishes to cross the main thoroughfare at the intersection, he simply pushes a button in a standard mounted on the corner. Thus the timer is allowed to function, flashing a green light for the cross street and changing the green light on the main thoroughfare to red.

◆

540-Cu.Ft. Compressor Unit

Announcement of a portable compressor unit with a displacement of 540 cu.ft. per minute has been made by Schramm, Inc., West Chester, Pa.



Large portable air compressor

Underlying principles of construction are the same as for the smaller units built by this company, including the use of a self-aligning clutch which disengages the compressor unit while the motor is being started. The power source is a four-cylinder 8x6-in. compressor driven by a heavy-duty Buda engine of either gasoline or diesel type. The unit can be obtained for stationary installation or with a variety of portable mountings.

Business Notes

Waterproofing—"Water, Water, Everywhere!" is the title of an unusual book of 52 pages published by the American Asphalt Paint Co., 844 Rush St., Chicago, Ill. The theme is a dissertation in narrative form upon the universal existence of water in various forms, its physical and chemical properties, its effects upon other substances, and the way in which these effects can be guarded against. Illustrations and decorations are in full color. Due to the expensive nature of the publication, it is being given free distribution only to prospective customers of the company; others are asked to pay $1 per copy.

Ingot Iron—Specifications covering Armco spiral welded pipe are given in an engineering bulletin recently published by the American Rolling Mill Co., Middletown, Ohio.

Arc Welding — Unusual arc-welding achievements and methods of testing and of welding are discussed in Welding Data Bulletin 15, a 16-p. publication of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Spraying Equipment—Bulletin G-5 of Littleford Bros., Inc., Cincinnati, Ohio, illustrates and describes spraying equipment for asphalt emulsions, cutback, road oils, silicate of soda and weed exterminators.

Testing Machines — Precision testing equipment for a number of purposes is briefly described and illustrated in a 4-p. folder issued by the Baldwin-Southwark Corp., Philadelphia, Pa.

Pumps—Engineering Data Sheet No. 1, issued by Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill., contains information on the selection of water supply pumps for buildings, including a chart for figuring pump capacities and other related data.

Brick—Common Brick Mfgrs. Association of America, Cleveland, Ohio, has issued Vol. 2 of its handbook, "Brick Engineering," which covers the design and construction of brick buildings. The author is L. B. Lent, chief engineer of the association. The book is illustrated by charts, diagrams and halftones and is handsomely bound in flexible composition.

Hand Tools—Shovels, scoops, spades and draining tools form the subject of Catalog D, a handsomely bound 56-p. illustrated publication of the Wood Shovel & Tool Co., Piqua, Ohio. An unusual feature is a pictorial margin index.

Natural Gas Treatment—Application of Papico natural gas odorization equipment is the subject of a leaflet issued by the Pacific Pipe & Supply Co., 1002 Santa Fe Ave., Los Angeles, Calif.

WELDING OUTFIT FOR RAILWAY SERVICE

For railway track maintenance operation involving welding, the units illustrated above have been assembled by Schramm, Inc., West Chester, Pa. The large car carries a six-cylinder gasoline motor, a 300-amp. welder and a 5½-kw. generator; is capable of propelling itself at 20 m.p.h. in either direction and will successfully negotiate railroad grades. Reels are provided to carry 1,000 ft. of welding cable and 1,000 ft. of duplex wire for a track grinder, which is mounted on the small three-wheeled car carrying a 3-hp. electric motor and a grinding wheel. There is also a small hand grinder for parting the track at the joints.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Waterworks			
Vancouver (B. C.)	Tunnel and pipe line	$1,038,250	Contract
Sewers			
Chicago	Sewers	5,000,000	Proposed
Dallas (Tex.)	Storm sewers	2,500,000	Proposed
Bridges			
San Francisco	Golden Gate Bridge	21,861,654	Contract
Uvalde (Tex.)	Bridges	1,000,000	Proposed
Streets and Roads			
Texas	Roads and bridges	4,500,000	Bids asked
Railways			
Illinois	Railroad	4,000,000	Proposed
Dams			
San Benito (Tex.)	Storage dam	10,000,000	Proposed
Unclassified			
Center (Tex.)	Storage tanks	1,400,000	Proposed
Federal Government			
Louisville	Post office	1,507,700	Contract
Fort Worth	Post office	1,017,000	Contract
Factories and Mills			
Vancouver (B. C.)	Pulp, saw mill, etc	6,000,000	Proposed
Power Plants			
Arkansas	Hydro electric plant	25,000,000	Separate contracts
Buildings			
Chicago	Office	12,000,000	Contract
New York	Office	15,000,000	Proposed
Newtown (Conn.)	Hospital group	1,773,161	Contract
Chicago	Fine arts		Bids asked
Cincinnati	Publishing	1,500,000	Proposed

WATERWORKS

PROPOSED WORK

Mich., Crystal Falls—City, J. H. Sanders, mgr., retained Holland, Ackerman & Holland, consult. engrs., 53 West Jackson Blvd., Chicago, Ill., to prepare plans rein.-con. power dam at City Power Plant. $30,000.

Mo., St. Louis—Water Dpt., L. Day, comr., City Hall, soon takes bids reconstructing and equipment rein.-con., brick boiler house at Chain of Rocks Water Works Pumping Station on Mississippi River, $400,000; laying mains in various parts city, $250,000; landscape work, roadways, at waterworks station Howards Bend, Missouri River, $46,251. Noted June 18.

S. C., Greenville—Greater Greenville Sewer and Sub-district Comns., will let contracts Aug. 8, installing water and sewer, $85,000; facilities in Parker Dist. $450,000; Augusta Road $100,000; and Northgate Heights. $610,000 bonds to be sold July 23 for same.

BIDS ASKED

Ia., Ames—July 29, by A. B. Maxwell, city clerk, 3 m.g. water softening plant. $30,000. Noted July 19.

Mass., Weston—July 23, by Metcalf & Eddy, engrs., 1300 Statler Bldg., Boston, water standpipe. $15,000. Noted June 25.

Mich., Ann Arbor—July 29, by H. H. Caswell, mgr. City Water Dpt., 6 m.g. storage reservoir together with pipe lines and special connections. $100,000. G. H. Sandenburgh, city engr.

N. Y., Albany—July 24, at office Dpt. Conservation, State Office Bldg., dam, intake, watermains, appurtenances on lands State Forest Preserve in Great Lot 2 Rogers Road Patent for Schroon Lake Water Dist., town of Schroon, Essex Co. Solomon & Keis, 257 Bway., Troy, consult. engrs.; adv. E. N.-R. July 16.

O., Cleveland—July 24, by City, furnishing, erecting 1 m.g. steel plate water storage tank. L. A. Quayle, City Hall, engr.

O., Cleveland—July 24, by J. McSweeny, dir. Dept. P. Welfare, 9th and Oak Sts., Columbus, 8,120 ft. 6 and 12 in. mains at Hawthorndon Farm, Cleveland State Hospital. $25,000. Jennings-Lawrence Co., Rowlands Bldg., Columbus, engrs.

S. D., Brookings—Aug. 3, by Regents Educ., C. W. Pugsley, pres., furnishing, installing 5,300 lin. ft. 8 in. c.i.; 2,050 lin.ft. 4 and 6 in. monocast; 4,400 lin.ft. 2 in. c.i.i threaded pipe for mains at State College. H. S. Carter, Engineering Bldg., engr.

Wis., Racine—July 28, by Bd. Water Comrs., City Hall, low lift suction well and pumping station, tile terrazzo work in pumping station, heating, plumbing, light and power wiring, switchgear and motor control. Alvord, Burdick & Howson, 1401 Civic Opera Bldg., Chicago, Ill., engrs. Noted Apr. 30.

CONTRACTS AWARDED

N. J., Paterson — Passaic Valley Water Comn., 156 Ellison St., motor driven pumping equipment in pumping station, Little Falls, to Turbine Equipment Co., 30 Church St., New York, $55,813. Noted June 18.

N. J., Woodcliff Lake—Hackensack Water Co., Park Ave., Weehawken, 5 m.g. concrete service reservoir in southwestern part Woodcliff Lake, to H. L. Harrison & Son, Inc., 1060 Broad St., Newark. Est. $15,000 or more.

N. Y., New York—Bd. Water Supply, G. J. Gillespie, pres., 346 Bway., sluice gates at Uptake Chamber, City Tunnel, Hill View Reservoir, to Hardie Tynes Mfg. Co., 800 North 2nd St., Birmingham, Ala., $37,233. Noted June 18.

N. Y., Remsen—Village Bd., waterworks, to Mondo Constr. Co., 417 South Townsend St., Syracuse, $34,925.

O., Cleveland—Watermains in Belvoir Blvd., Contr. 149-9, Group 3, to Curro & Whittaker, Green and Glenridge Rds., $332,050.

Wash., Everett—City Council, new diversion dam, intake system of Pilchuck River Gravity System, to Snohomish Constr. Co., Everett, $15,160.

B. C., Vancouver—E. A. Cleveland, engr., 500 Beatty St., 3,100 ft. pressure tunnel under 1st Narrows, 2 shafts 8 x 400 ft. deep, Burrard Inlet, to Northern Constr. Co. Ltd., 736 Granville St., $1,003,584; 4,700 ft. 6- to 7-in. welded or concrete pipe line, concrete lined, through Stanley Park, to Harvaison & Lamond, 615 Hastings St. W., $234,666. Noted June 18.

Ont., Toronto—W. J. Stewart, mayor, City Hall, 4,000 ft. 54 in. steel pipe, welded, gunite inside and concrete outside, from high level pumping station to St. Clair Ave. Reservoir, to Grant Contg. Co. Ltd., 47 Wellington St. E., $173,000. Award of steel pipe not made yet. Noted June 18.

SEWERS

PROPOSED WORK

Ill., Chicago—Sanitary Dist. of Chicago, 15 ft. rein.-con. sewer in Jefferson St. and 10- to 15-in. rein.-con. sewer in Wacker Dr. $2,500,000 each. E. J. Kelly, 910 South Michigan Ave., engr.

Ind., Richmond—Bd. P. Wks. approved report S. W. Hodgin, engr., Richmond, for sewage disposal plant. $568,290.

Ky., Louisville—City soon takes bids 3,620 ft. Beals Branch Trunk Sewer, Sect. B; 6,875 ft. Mill Creek Trunk Sewer; 3,650 lin.ft. Trevelian Way Trunk Sewer, Sect. A. W. M. Kaye, M. E. Taylor Bldg., engr.

Mo., St. Louis—Bd. P. Serv. soon takes bids rein.-con., lateral connections, in Rock Creek Public Outlet Sewers, $185,500; and in Wherry Ave. Public Outlet Sewer, $160,000. W. W. Horner, city engr. Noted June 11 and 18.

S. C., Greenville—See "Water Works."

Tex., Dallas—City, c/o E. Goforth, secy., storm sewers. $2,500,000. O. H. Koch, Dallas, dir. P. Wks. W. W. Horner, St. Louis, Mo., consult. engr.

BIDS ASKED

Ill., Chicago—July 30, by J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., Des Plaines River Intercepting Sewer, Contr. 3.

Ill., Chicago—Aug. 13, by J. J. Sullivan, clerk Sanitary Dist. of Chicago, 910 South Michigan Ave., Calumet Sewage Treatment Works Extension, Div. D. R. A. Woodhull, chn. Finance Com.; adv. E.N.-R. July 23.

Ind., Danville—July 31, at office Town Bd., F. C. Guthrie, pres., sewage treatment plant, 4,613 cu.yd. excav., 1,800 cu.yd. stone, 7,400 ft. 4 in. split tile for filter, 1,350 ft. 15 in. double strength and 10,751 ft. 8 to 12-in. standard vitr. pipe, forty-five 8 in. plugged Y branches for house connections, twenty-five 8-in. plugged manhole connections. $56,500. C. H. Hurd, 307 Lumber Insurance Bldg., Indianapolis, consult. engr.

Ky., Louisville—Aug. 6, by Commissioners of Sewerage, 400 Marion E. Taylor Bldg., 4th and Jefferson Sts., Beals Branch Trunk Sewer, Sect. B, Contr. 57. W. M. Caye, technical engr.; adv. E.N.-R. July 23.

Ky., Louisville—Aug. 20, by Commissioners of Sewerage, Marion E. Taylor Bldg., 4th and Jefferson Sts., Mill Creek Trunk Sewer, Contr. 58. W. M. Caye, technical engr.; adv. E.N.-R. July 23.

N. Y., Albany—Aug. 5, at office Dpt. Mental Hygiene, State Office Bldg., sewage disposal system at Hudson River State Hospital, Poughkeepsie. F. W. Parsons, comr.; adv. E. N.-R. July 16.

N. Y., Geneseo—July 30, by Dpt. Educ., Education Bldg., Albany, sewers and water lines at Geneseo State Normal School. F. P. Graves, comr.; adv. E.N.-R. July 23.

N. Y., Oswego—July 30, by Dpt. Educ., Education Bldg., Albany, sewers and water lines at Oswego State Normal School. F. P. Graves, comr.; adv. E.N.-R. July 23.

CONTRACTS AWARDED

Kan., Wichita—City, sewage disposal plant, to M. E. Gillioz, Monett, $324,398; switchboard and electrical equipment, to Shelly Electric Co., Wichita, $5,776; gas holder, to Darby Corp., Wichita, $2,287; sewage pumps, to DeLaval Pump Co., Wichita, $13,187; digester, to Harding Co., Wichita, $35,100; bar screens and clarifier, to Link Belt Co., Wichita, $24,435. Grand total $401,183. Noted June 19.

Ky., Louisville—Bd. Comrs. Sewerage, 400 M. E. Taylor Bldg., Peachtree Street Submain Sewer, to Thomas D. Nolan Co., 14101 Plymouth Ave., Detroit, Mich., $37,127. Noted June 18.

N. J., Hillside—Township Com., Town Hall, sanitary sewer, extending house connections

See proposal advertising on page 72

LEADITE

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Portland Me.

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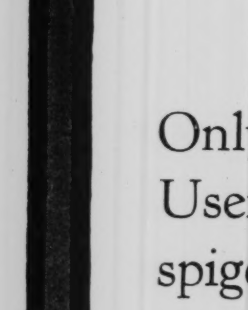
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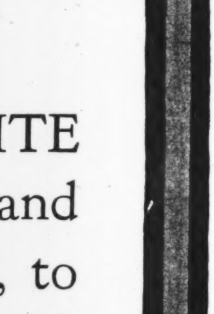

Sewers (Continued)

under state hy. near John St., to J. and M. Miele, 143 Mount Pleasant Ave., West Orange. Est. $25,000.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Mansfield Pl., to S. Guerriero Co., 1024 66th St., $6,818; 27th St. and Delamore Pl., to A. Paino, 2016 East 14th St., $6,131 and $7,470 respectively; East 38th St., to R. Nazzarro, 7101 11th Ave., $1,704; Hendrickson Ave., to S. Guerriero Co., 1024 66th St., $1,760; 50th and East 26th Sts., to R. Vaccaro, 1286 60th St., $1,156 and $3,101 respectively. Grand total $28,140. Noted June 25.

N. Y., Utica—Bd. Contr. & Supply, completing railroad intercepting sewer, to H. R. Beebe Corp., Inc., 404 Court St., $126,000. Noted Feb. 12, under "Contracts Awarded."

O., Cleveland—For Sect. 3 Big Creek Intercepting Sewer, 1,900 ft. 5 ft. Circular E and C brick pipe, to Manson Co., Engineers Bldg., $38,719.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Schedule A, main sewer, in Lakeside Ave. to Almino Frunzi, 513 High St., $38,077; Schedule B, sewage disposal project, Somerset Low Level Collecting Sewer across city property in Castor and Delaware Aves., Casper, Bath, Allen, Ann and Melvale Sts., to Yetman & Garafola, 3701 North Broad St., $543,356. Noted June 18.

Wis., Milwaukee — Metropolitan Sewerage Comn., Sects. 1 and 3, River Hills-Brown Deer Main Sewer, to Wenzel & Henoch, 5025 State St., $139,478 and $169,676 respectively.

WASTE DISPOSAL

PROPOSED WORK

N. Y., Douglaston—Dpt. Sanitation, Municipal Bldg., New York, bids late in fall, general contract incinerator. $500,000. Noted July 9.

N. Y., Pelham Manor—Village soon lets contract garbage disposal plant, Good Pl. and West St. To exceed $100,000. Noted June 25.

CONTRACTS AWARDED

N. Y., Pelham Manor — Village, refuse incinerator, to Pittsburgh Des Moines Steel Co., 270 Bway., New York, $44,650. Noted June 25.

Pa., Erie—City, M. J. Henry, clk., City Hall, general contract 1 and 2 story, 60 x 190 ft. garbage and refuse incinerator plant, to Upton & Lang, 1006 Commerce Bldg., $41,889; plumbing, to W. Veith, 415 East 18th St., $2,432; heating, to J. M. Whitby, 1301 East 28th St., $2,841; electrical work, to B. Tatle, 8 East 11th St., $1,700. Grand total $48,862. Noted July 2.

BRIDGES

PROPOSED WORK

Maryland—State Roads Comn., G. C. Uhl, chn., Federal Reserve Bank Bldg., Baltimore, concrete steel bridge over Wills Creek, Allegany Co., $50,000—steel bridge over Potomac River between McCool, Md. and Keyser, W. Va., Allegany Co., $28,000—steel, concrete bridge over Bohemia River at Chesapeake City, $310,000—steel bridge over Octoraro Creek, on road from Oakwood to Rising Sun, $50,000, both Cecil Co.—steel, concrete bridge on Rhodesdale-Eldorado Rd., Dorchester Co., $140,000. H. Williar, Jr., Federal Reserve Bank Bldg., Baltimore, engr.

Tex., Uvalde—State and Uvalde Co., G. B. Fenley, county judge, rein-con. steel bridges over Sabinal, Blanco, Main and Dry Frios and Nueces Rivers. $1,000,000. G. Gilchrist, Uvalde, dist. engr.

BIDS ASKED

Ill., Chicago — July 28, by Lincoln Park Comrs., L. Nettlehorst, secy., North Clark and Center Sts., substructure of North Viaduct between Michigan Canal and Chicago River—Outer Drive Improvement, incl. 126,000 cu.ft. cylindrical sub-piers to bedrock 1,500 cu.yd. concrete in subsurface girders, sub-pier caps, pile caps, 400,000 lb. reinforcing steel, 200 lin.ft. rein.-con. dock.

Ia., Denison—July 28, at office Auditor Crawford Co., furnishing six 36 x 16 ft. standard VIC I-beam spans, f.o.b. Denison; 6 rein.-con. box culverts. Address County Engineer or Auditor.

Maryland—July 28, by State Roads Comn., G. C. Uhl, chn., Baltimore, steel, concrete girder bridge, Contr. F-119-57, Frederick Co.—altering and extending 2 bridges, Contr. M-169-311, Montgomery Co.—gunite work in connection with existing bridge over Beaver Creek, Contr. W-95-611, Washington Co. L. H. Steuart, secy.; adv. E.N.-R. July 23.

Maryland—Aug. 4, by State Roads Comn., G. C. Uhl, chn., Baltimore, single leaf bascule bridge, Contr. Wo-69-17, Worcester Co. L. H. Steuart, secy.; adv. E.N.-R. July 23.

Md., Baltimore—July 29, by Bd. Awards, Hoffmanville Bridge over Gunpowder River, and box culvert, Locust Bottom Branch. N. L. Smith, Municipal Bldg., hys. engr.

Md., Baltimore—Aug. 5, by Bd. Awards, Loney's Lane Bridge over Pennsylvania R.R.; adv. E. N.-R. July 23

Mass., Boston—July 28, by Dpt. P. Wks., J. A Rourke, comr., rebuilding concrete steel bridge over New York, New Haven & Hartford R.R., Shawmut Ave. $30,000. Noted Jan. 29.

Missouri—July 31, by State Hy. Bd., Jefferson City, bridges in Cape Girardeau, Iron, Moniteau, Putnam, St. Clair, St. Louis, Stone, Shannon and Taney Counties. T. H. Cutler, ch. engr.

New Jersey—Aug. 3, by State Hy. Comn., Trenton, steel superstructure with ramp connections, constructing for retaining walls, embankment, pavements, other incidental work Route 25, Connecting Link, Sects. 8 and 8-A, Contr. 51, Essex Co. A. L. Grover, ch. clk.; adv. E. N.-R. July 16.

N. J., Paterson—July 29, by Bd. Freeholders Passaic Co., Court House, 260 ft. beam bridge over Passaic River, on Spruce St. $300,000. G. Ferguson, Court House, co. engr. Noted Apr. 23.

Utah—July 27, by State Rd. Comn., Salt Lake City, 128 ft. rein.-con. bridge, approaches on Arrow Head Trail, at Sevier River Reservoir Dam, Juab Co. H. S. Kerr, state hy. engr.

West Virginia—July 28, by State Road Comn., Charleston **(P. means Project)**, Caldwell Bridge 1280, concrete superstructure, incl. 2 piers, 2 abutments, P. 3505, Greenbrier Co.—Big Run Bridge 1278, 50 ft. I-beam span on Ashlar Masonry substructure, P. 3413, Jackson Co.—New Creek Bridge 1232, three 40 ft. concrete deck girder spans, P. 3010 Mineral Co.—Red Mill Bridge 1284, one 50 ft. I-beam span superstructure on concrete substructure, P. 3462-A, Monroe Co.—Mill Point Bridge 1266, 50 ft. I-beam superstructure on concrete substructure, P. 2191, Pocahontas Co.—Dye Bridge 1268, 90 ft. concrete arch span, P. 143-C—Carpenter Bridge 1269, 80 ft. concrete arch span, P. 143-D—Wilson Bridge 1270, 65 ft. concrete arch span, P. 143-D, all foregoing in Ritchie Co.

CONTRACTS AWARDED

Calif., San Francisco—Golden Gate Bridge & Hy. Dist., Financial Center Bldg., Golden Gate Bridge, Contr. 1-A, steel superstructure, to McClintic-Marshall Co., 2050 Bryant St., $10,494,000; Contr. 1-B, cable, suspenders and accessories, to American Cable Co., 425 2nd St., $6,255,767; Contr. main piers, to Pacific Bridge Corp., Walter and Salmon Sts., Portland, Ore., $2,260,000; Contr. 3, anchorages, to Barrett & Hilp, 918 Harrison St., $1,645,841; Contr. 4, San Francisco and Marin approach spans, to Columbia Steel Co., Russ Bldg., $996,000; Contr. 6, Sausalito Road, to Granfield & Carlin, 67 Hoff Ave., $67,586; Contr. 8, electrical work, to Progressi Signal & Lighting Co., 2112 Santa Fe Ave., Los Angeles, $132,945. Grand total $21,852,139. Contr. 10, 100,000 bbl. cement, will be purchased in open market. (The contracts become definite as soon as the first block of bonds already voted are sold.) Contracts 5, 7 and 9 not yet awarded. Noted Apr. 30.

N. J., Newark — Essex Co. Park Comn., multiple arch span and concrete revetment walls along 2nd River, to J. W. Heller Co., 1878 Springfield Ave., Maplewood, $102,925. Noted June 25.

N. Y., Tonawanda—W. G. Hickman, comr. Erie Co., 100 ft. span steel plate girder bridge, 40 ft. roadway, 2 ft. walks, over Ellicott Creek, Delaware Ave., to A. L. Jordan, 74 East Hazelton St., Kenmore, $73,900. Noted June 25.

Texas—Missouri Valley Bridge & Iron Co., Box 921, Dallas, sublet contract approaches, relief openings and Little Brazos Bridge, Brazos and Burleson Counties, to Geo. W. Condon Co., Magnolia Bldg., Dallas. Noted July 9, under "Contract Awarded."

STREETS AND ROADS

BIDS ASKED

California—Aug. 5, by C. H. Purcell, state hy. engr., Sacramento, untreated crushed gravel or stone surfacing and surfacing mile stockpiled, 9.3 mi. hy. between Diddy Hill and Montgomery Creek, Shasta Co.; grading, concrete paving 7.6 mi. hy. between Tipton Crossing and Tulare, Tulare Co.

Calif., Fullerton—Aug. 4, by City Council, curbing, walks, guttering, 6 in. asphaltic concrete paving 40,000 sq.ft. and asphaltic resurfacing 69,550 sq.ft. existing pavement, and constructing 1 rein.-con. bridge, North Spadra Rd.

Calif., Los Angeles—July 29, by Bd. P. Wks., grading, curbing, walks, National asphaltic concrete paving 170,500 sq.ft. Morningside Way and Glyndon Ave. Impvt. Dist. Former bids rejected.

Calif., San Francisco — July 29, by S. J. Hester, secy. Bd. P. Wks., grading, curbing, walks, guttering, 2 in. asphaltic concrete on 6 in. Class F concrete paving 25,000 sq.ft. Grafton Ave. and Garfield St.

Colorado—July 28, by State Hy. Dpt., Denver, grading, drainage structures, gravel surfacing 10,319 mi. State Hy. 4 between Hartsel and Florissant, Federal Aid Project 158-B, Park Co.; 8.664 mi. Monte Vista-Del Norte Rd., Federal Aid Project 270-E, Rio Grande Co. C. D. Vail, hy. engr.

Connecticut — July 27, by J. A. Macdonald, state hy. comr., Hartford, gravel surfacing 11,900 ft. hy. Canterbury—12,300 ft. Columbia—7,500 ft. Hebron—13,500 ft. Scotland—17,420 ft. Somers, state furnishes bituminous coated corrugated metal pipe on foregoing—gravel surfacing 21,120 ft. Enfield, state furnishes bituminous coated corrugated metal pipe and will oil—gravel surfacing 22,900 ft. Kent, state furnishes bituminous coated corrugated metal and rein.-con. pipe—gravel surfacing 18,675 ft. Shelton—7,600 ft. Westbrook, state furnishes rein.-con. pipe on foregoing—grading, gravel surfacing 7,000 ft. Clinton, state furnishes rein.-con pipe—bituminous macadam paving 4,347 ft. Darien, state furnishes rein.-con pipe and bituminous material—trap rock furnished and spread on 4,800 ft. Madison—trap rock macadam paving 900 ft. Griffin Rd., and grading 8,448 ft. Tariffville Rd., Windsor, state furnishes bituminous coated corrugated metal pipe and will do oiling—trap rock waterbound macadam paving 6,854 ft. Windsor Locks, state furnishes coated corrugated metal pipe and will do oiling and scraping—crushed stone or gravel surface treating 25,350 ft. Wilton, state furnishes bituminous coated corrugated metal pipe—32,380 ft. Ridgefield, state furnishes bituminous coated corrugated metal and rein.-con pipe; adv. E.N.-R. July 23.

Idaho—July 28, at office Commissioner Dpt. P. Wks., Boise, grading, crushed stone surfacing 9.559 mi. Gooding-Fairfield Hy. south from Camas Co. line, Gooding Co. A. Harbour, comr.

Illinois — State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, cancelled bids to have been opened July 15. Will readvertise. Noted July 9.

Iowa—July 28, at office C. R. Livingston, dist. engr. State Hy. Comn., at Cedar Rapids, maintenance gravel or stone surfacing 32.3 mi. M-604, Rd. 1, Johnson Co.—14.2 mi. M-605, Rd. 8—5.5 mi. M-606, Rd. 59—6.3 mi. M-607, Rd. 96, all foregoing Tama Co.—3.12 mi. M-608, Rd. 101, Benton Co.

Ia., Indianola—July 27, at office Auditor Warren Co., grading 7.41 mi. trunk and local roads, 14 concrete culverts, extensions, 500 lin.ft. 18 in. c.i. pipe. Address County Engineer or Auditor.

Ia., Northwood—July 27, at office Auditor Worth Co., construction, maintenance gravel surfacing from local pits, incl. 35,676 cu.yd. gravel, 270,290 units overhaul, 9,100 cu.yd. stripping pits. T. T. Teall, Northwood, co. engr.

Ia., Sioux City—July 27, at office Auditor Woodbury Co., construction and maintenance graveling 26 mi. trunk road. Address County Engineer or Auditor.

Ky., Louisville—July 27, at office Dpt. P. Wks., City Hall, sidewalks on 30 streets, avenues and driveways. A. A. Will, dir. F. Moss, engr. ass't to director.

La., Tallulah—Aug. 5, by Police Jury Madison Parish, earth road embankment, culverts, 2 bridges on 4.5 mi. road. P. O. Benjamin, parish engr.

Maryland—July 28, by State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 1.86 mi. Contr. C-47-82, and 1.3 mi. Contr. C-53-82, both Calvert Co.—0.99 mi. Contr. Ch-107-84, Charles Co.—macadam paving 0.75 mi. Contr. H-132-42, Harford Co.—concrete shoulders 2.9 mi. Contr. Wi-81-111, Wicomico Co. L. H. Steuart, secy.; adv. E. N.-R. July 23.

Massachusetts—July 28, by Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam and rein.-con. paving 26,944 ft. hy., incl. rein.-con. bridge, Rehoboth, Seekonk and Swansea; rein.-con. paving 25,536 ft. hy., incl. steel stringer bridge over New York, New Haven & Hartford R.R., Auburn and Worcester.

Mass., Needham—See "Contracts Awarded."

Michigan—July 29, by H. G. Oakes, div. engr. Plymouth, grading, shaping, concrete paving 3.228 mi. FO50-6C-2, Macomb Co., for State Hy. Comn., Lansing.

Mississippi—July 27, by State Hy. Comn., Jackson, earth shoulders on sections Lake-Newton Rd., incl. 17,000 cu.yd. borrow excav., 1,000 units borrow excav. overhaul, Federal Aid Project 197-A reopened, Newton Co. C. M. Williamson, dir.

Missouri—July 31, by State Hy. Bd., Jefferson City, grading, crushed stone, shale, gravel, concrete paving roads in Boone, Buchanan, Camden, Christian, Cape Girardeau, Clay, Henry, Hickory, Howard, Iron, Jasper, Johnson, Lafayette, Moniteau, Newton, Osage, Platte, Putnam, Reynolds, St. Clair, Schuyler, Shannon, Stone, Stoddard and Taney Counties. T. H. Cutler, state engr.

Mo., Clayton—July 29, by Bd. Comrs. St. Louis Co., grading, concrete paving Ballas Rd., Midland Blvd., Plymouth and Annie Aves. R. Jablonsky, Court House, co. engr.

N. J., Paterson—Aug. 4, by Bd. Freeholders Passaic Co., Court House, paving Midvale Rd. Midvale. $25,000. G. Ferguson, Court House, co. engr.

New York.—Aug. 4, by A. W. Brandt, comr. Hys., Albany, improving hys. in Monroe, Wayne, Tompkins and Westchester Counties—reconstructing hys. in Broome, Delaware, Fulton, Monroe, Putnam, Westchester and Saratoga Counties—bridges in Delaware and Schoharie Counties; adv. E. N.-R. July 16.

N. Y., Long Island City—July 27, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading, curbing, sidewalks, sheet asphalt on concrete paving 31st Rd., Queens and Horace Harding Blvds., Continental, 37th, Catalpa and Cooper Aves., Rowan, 52nd, 45th, and 130th Sts.—grading curbing, bituminous macadam paving 201st St. and 107th Ave.—grading, sidewalks Yellowstone Blvd. and 73rd Ave.—grading, curbing, stone block guttering—58th St.

N. Y., Mount Pleasant—Aug. 10, by Westchester Co. Park Comn., 72 West Ponfield Rd., Bronxville, grading, concrete paving 6,300 cu.yd. Bronx Parkway extension from Bway., north to Saw Mill River Rd., at Hawthorne, Mount Pleasant; adv. E.N.-R. July 23.

N. Y., Pelham Manor—Aug. 10, by Bd. Village Trustees, Village Hall, Penfield Pl., improving hys., sewers. J. J. Dworschak, 256 Hugenot St., New Rochelle, village engr.; adv. E.N.-R. July 23.

N. Y., Wassaic—Aug. 5, at office Dpt. Mental Hygiene, State Office Bldg., Albany, concrete roads at Wassaic State School. F. W. Parsons, comr.; adv. E.N.-R. July 23.

Constr. News page 29A

Streets and Roads (Continued)

O., Garfield Heights—July 24, by City, vitr. brick, sheet asphalt or concrete paving Clearview Rd. and Park Knoll Dr. To exceed $25,000. R. Munz, City Hall, engr.

O., Lisbon—July 27, by Comrs. Columbiana Co., widening, repaving 4,689 ft. Clark Ave., 34 ft., in Wellsville, State Route 7, 7 in. concrete base with 3 in. paving block surface $87,200, concrete surface, $60,033.

Pennsylvania—Aug. 7, by State Hy. Dpt., Harrisburg, surfacing 14 mi. roads in Armstrong, Bucks, Chester, Elk, McKean and Monroe Counties. S. S. Lewis, secy.; adv. E.N.-R. July 23.

Pa., Phila.—July 28, by Bureau of Hys., Dpt. P. Wks., A. Murdoch, dir., City Hall Annex, Schedule A, grading; Schedule B, grading and paving (assessment work)—Schedule C, asphalt paving (assessment work)—Schedule D, asphalt repaving—Schedule E, redressed granite block paving—Schedule H, furnishing and delivering electrical supplies—Schedule I, country road improving.

Texas—July 30, 31 and Aug. 1, by State Hy. Comn., G. Gilchrist, state hy. engr., Austin, concrete paving 95 mi. hys., other forms of hard surfacing 89.7 mi. hys., grading, drainage structures 319.8 mi. hys., 18 bridges in Brown, Calhoun, Cameron, Cherokee, Coleman, Crockett, Irion, DeWitt, Ellis, Dallas, Freestone, Gray, Grayson, Hopkins, Houston, Trinity, Jasper Kinney, Madison, Karnes, Kendall, Matagorda, Palo Pinto, Panola, Potter, Reagan, Reeves, Sterling, Wharton, McLennan, Concho, Limestone, King, Tarrant, Denton, San Patricio, Jackson, Cooke, Van Zandt, San Jacinto, Jim Wells, Kleberg, Childress, Colorado, Motley, Robertson and Wheeler Counties. $4,500,000-$5,000,000.

Wash., Seattle—Aug. 3, by Comrs. King Co., reconstructing, paving 4.75 mi. Woodinville-Duvall Rd. $125,000. T. D. Hunt, Seattle, co. engr. Noted May 28.

West Virginia—July 28, by State Road Comn., Charleston, grading, drainage structures 11.78 mi. Belington-Nestorville Rd., P. 3493, Barbour Co.—5.89 mi. Clarksburg-Wolf Summit Rd., P. 185-B, Harrison Co.—6.61 mi. Roderfield-Indian Creek Rd., P. 190-A McDowell Co.—5.08 mi. Elmore-Herndon Rd., P. 1054, Wyoming Co.—6.72 mi. Jesse-Oceana Rd., P. 3485-B, Wyoming Co.—surface treating 21.57 mi. Projects 159-160-A and 3293-B, Nicholas Co.—14.45 mi. Whitesville-Racine Rd., Project 3091-32-5 and part of 3104, Boone Co.—grading, concrete paving 1.76 mi. streets in Charlestown and Ransom, P. 3519, Jefferson Co.

Wisconsin—July 30, by State Hy. Comn. and Hy. Com. Monroe Co., LaCrosse, grading, concrete paving 5,140 sq.yd. approaches to North Toman Overhead, Monroe Co.

Wisconsin—July 31, by State Hy. Comn. and Hy. Coms. Grant, Crawford, Iowa and Richland Counties, Court House, Lancaster, concrete paving 7,434 sq.yd. Cuba City-Hazel Green Rd., Grant Co.—Richland-Center-Buck Creek Rd., Richland Co.—crushed stone surfacing 11,972 cu. yd. Mount Stering-Ferryville Rd., Crawford Co.—Dodgeville-Lone Rock Rd., Iowa Co.

Wis., Rhinelander—July 28, by State Hy. Comn. and Hy. Com. Oneida Co., grading 5.38 mi. Rhinelander-Lake George Rd., S.A.P. 7881 and Lake George Grade Separation (approaches) Oneida Co.

CONTRACTS AWARDED

California — Division Engineer State Hy. Comn., Sacramento, oil treated crushed gravel or stone borders surfacing 43.2 mi., Imperial Co., to R. E. Hazard Contg. Co., 2548 Kettner St., San Diego, $135,587—bituminous treated crushed gravel surfacing 2.8 mi., Calaveras Co., to G. French, Jr., Stockton, $11,241—oil surfacing 30.6 mi. Kern Co., to Oilfields Trucking Co., Taft, $9,879—grading, oil treated crushed gravel or stone surfacing 23.7 mi. San Bernardino Co., to H. W. Rohl, 727 West 7th St., Los Angeles, $363,869. Grand total $520,576. Noted June 25.

California—Bd. Directors Joint Hy. Dist. 15, at Santa Ana, grading (using toncan culverts), 9.04 mi. Joint Hy. Dist. 15, Ortega Hy., Riverside and Orange Counties, to H. W. Rohl Co., 4351 Alhambra Ave., Los Angeles, $152,953. Noted June 19.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., improving Mather-Hetch Hetchy Rd., to A. G. Raisch, 46 Kearny St., using concrete curbs, $125,714.

Calif., San Jose—H. A. Pfister, clk. Santa Clara Co., asphaltic concrete surfacing 616,700 sq.ft. Senter, Tulley and Story Rds., to Valley Paving & Constr. Co., Bank of America Bldg., Fresno, $56,040; oil macadam paving 325,000 sq.ft. Foxworthy Ave., to A. J. Raisch, Burrell Bldg., $17,990.

Calif., San Rafael—E. W. Smith, city clk., grading, curbing, guttering, hydrated concrete on rock sub-base paving Laurel Place, to N. M. Ball, 1889 Yosemite Rd., Berkeley, $17,665.

Ind., Columbia City—Whitley Co., graveling 13,807 ft. F. M. Glass Rd. to J. A. Bender & Son, Kimmell, $5,359 est. $7,485—11,400 ft. Ray W. Wigent Rd., to D. Gallivan, Columbia City, $7,987 est. $15,356—13,592 mi. Alfred Cooperrider Rd., to Sybole Sand & Gravel Co., Marion, $11,616 est. $15,679—concrete paving Cicero L. Thomas Rd., to Betts & Essinger, Columbia City, $18,440 est. $35,140. Grand total $43,402. Noted June 25.

Ind., Decatur — City Council, concrete resurfacing 2nd St., to O. P. Macklin, Decatur, $27,872.

Ind., Kentland—Bd. Comrs. Newton Co., macadam paving Andrew T. Benson Rd., to W. C. Babcock Grain Co., Rensselaer, $5,983 est. $11,689—Roy Smart and Walter Sorenson Rds., to A. M. Skinner, Morocco, $10,800 and $11,500 respectively est. $12,854 and $13,598 respectively. Grand total $28,283. Noted June 19.

Ind., Jasper — Dubois Co., graveling Andy Lampedt Rd., to A. B. Krempp, Jasper, $18,247. Est. $26,415.

Ind., La Porte—La Porte Co., concrete paving James Cullen Rd., to Cook Bros., La Porte, $20,803 est. $29,000; Emil Greiger Rd., to Gross Constr. Co., La Porte, $19,370 est. $19,420. Noted June 25.

Ind., La Porte — La Porte Co., concrete paving William Swank Rd., to Cook Bros., La Porte, $25,269. Est. $48,482. Noted June 18.

Iowa—State Hy. Comn., Ames, grading, concrete paving 31,543 yd. State Hy. 9, 18 ft., to C. F. Lytle Constr. Co., Sioux City, $64,447.

Mass., Needham—Town, Bd. Selectmen, Town Hall, improving Nehoiden St., separate contracts. $25,000.

Michigan—State Hy. Comn., Lansing, widening, grading, gravel surfacing 12 mi. Project MO2-21C-1, Alger Co., to Alger County Road Comn., Munising, $47,475—14.4 mi. Project MO36-10C-6, Iron Co., to Iron County Road Comn., Crystal Falls, $45,923—6.4 mi. Project MO52-26C-1, Marquette Co., to Marquette County Road Comn., Ishpeming, $45,540—10.7 mi. MO42-6-C-3, Keweenaw Co., to Keweenaw County Road Comn., Ahmeek, $25,000. Grand total $163,838.

Mo., Clayton—St. Louis Co., Court House, to W. F. Smith, 6635 Delmar Blvd., University City, grading, paving 3,400 ft. Central Ave. $26,440—to W. H. Bleck, 251 Railroad Ave., Ferguson, rein.-con. paving 286 ft. Sacramento Ave. $2,427; sidewalks, Jennings Station Rd., $1,095—to Independent Quarry Co., 3650 Chouteau Ave., St. Louis, Greenway Ave. $4,941; 18,231 sq.ft. Telegraph Rd. $136,001—to C. P. O'Reilly Constr. Co., Wainwright Bldg., St. Louis, grading 19,849 sq.ft. Eatherton Rd. $54,202; grading, graveling 12,325 ft. Ballwin Rd., $37,889; 2,700 ft. Oak St. $16,060—to Bangert Bros. Constr. Co., 44A South Florissant Rd., Ferguson, bituminous surfacing 6,908 ft. Centaur Rd. $30,545—to C. M. Berry Constr. Co., 2732 Sutton Ave., Maplewood, 464 sq.ft. Lacede Station Rd., $5,317. Grand total $314,737.

New Jersey—State Hy. Comn., Trenton, grading, 8 in. rein.-con. paving 41,708 sq.yd. Burlington Co., to C. D. Prosser, Pitman, $148,702. Noted July 2.

N. J., Hackensack—Bergen Co., Court House, grading, bituminous macadam paving road between Dumont and Cresskill, to J. P. Burns, Park Ave., Dumont, $35,836 — grading, sheet asphalt on concrete paving Railroad Ave., Park Ridge, to G. M. Brewster & Son, 253 West Fort Lee Rd., Bogota, $35,024—Boulevard extension, Hasbrouck Heights and Hackensack, to J. Kinzley Co., Zabriskie St., $58,268—Hoyt Ave., Fort Lee, to F. L. Harrigan, 872 River Rd., Edgewater, $19,223—Kinderkermack Rd., Oradell, to T. Adametz, Market St., East Paterson, $17,722. Grand total $166,074.

N. J., Jersey City—Bd. City Comrs., City Hall, grading, granite block on concrete paving Provost St., to Lettiere-Bellezza Co., 921 Bergen St., Jersey City, 86¼% $25,000 appropriation. Noted June 12.

N. J., Newton—Bd. Freeholders Sussex Co., Court House, improving 4.5 mi. road from Woodpecker Point to Hainesburg, to Salmon Bros., Netcong, $185,081; 3.8 mi. road from Newton to Ross Corner, to S. J. Groves & Sons Co., Ridgefield, $174,123. Noted June 11.

N. J., Roselle Park—Boro Council, Boro Hall, sheet asphalt paving Locust and Walnut Sts., to Union Paving Co., Broad and Stiles St., Phila., Pa., $23,764. Noted July 2.

New York—A. W. Brandt, comr. Hys., State Office Bldg., rebuilding, widening 5.79 mi. Erie Co., to Charles Ream, 59 Westgate Ave., Kenmore, $339,324. Noted June 18.

New York—Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, Babylon, grading Southern State Parkway from Massapequa to Nassau-Suffolk Co. line constructing 2 bridges one at Massapequa Glen Cove Rd. other at Beth Page Rd.; also bridges at Henry St. and Dogwood Ave., to Municipal Constr. Co., Municipal Bldg., Binghamton, $122,576 and $131,584 respectively, grading Northern State Parkway from Queens line east to Lakeville Rd. and constructing bridges at Motor Parkway and Lakeville Rd., to Smith Bros., Pelham, $100,216. Grand total $357,672. Noted June 25.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to Brooklyn Alcatraz Asphalt Paving Co., 407 Hamilton Ave., asphalt paving Ashland Ave., $25,824; Carroll St. $5,742; Driggs Ave. $21,141; Lenox Rd. $2,160, 6th Ave. $30,365—to B. Turecoma Contg. Co., New Cropsey Lane, Beverly Rd. $21,415; Dahill Rd. $40,226; Ditmas Ave. $11,843; East 15th St. $5,558; East 4th St. $5,794; East 28th St. $7,792; East 46th St. $5,029; East 49th St. $5,718; East 52nd St. $7,048; Lamont Court $5,288—to Concrete Co., Metropolitan Ave., regulating DeWitt Ave. $4,099 — to M. A. Zapponi, East 51st St., $1,739—to Columbia Eng. Contg. Co., 401 Bway., New York, granite paving Flushing Ave., $42,875—to Carblock Paving Co., Stagg St., Johnson Ave. $12,140—to Pomonok Asphalt Paving & Building Material Co., 1246 Grand St., asphalt paving Pine St., $4,166—to Heapy Constr. Co., 115 78th St., regulating Warwick St. $3,715—to W. J. McHale Contg. Co., 1250 Jefferson Ave., Avenue U $6,020. Grand total $275,697. Noted June 25.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., widening Allen St., to Meehan Paving & Constr. Co., 90 West St., $244,147. Noted July 7.

N. Y., Utica—Onondaga Co., A. O'Brien, supt., bituminous macadam paving 4.06 mi. Oriskany Falls-Waterville Rd., to Dale Eng. Co., 404 Court St., $73,147—1.2 mi. New York Mills-New Hartford Rd., to Utica Constr. Co., 622 South St., $35,853.

O., Cleveland — Bd. Comrs. Cuyahoga Co., granite curbing, 4 in. drain tile guttering cement sidewalks, grading, 3 in. vitr. brick paving 13,697 sq.yd., and sheet asphalt paving 6,800 sq.yd. Cedar Glen Rd., to Highway Constr. Co., Builder Exch. Bldg., $102,611. Est. $149,800.

O., Cleveland—Cuyahoga Co., grading, concrete paving 7,700 sq.yd. Belvoir Blvd., to Loesch & Green Constr. Co., 4169 Pearl Rd., $232,147; grading, sandstone curbing, guttering, concrete paving 21,680 sq.yd. Grantwood Dr., to Highway Constr. Co., Builders Exch. Bldg., $82,075. Est. $148,200.

Ore., Portland—Widening, paving 42 blocks Hawthorne Ave., to Jacobsen-Jensen Co., 407 Stanton St., $65,774. Est. $82,840.

Pennsylvania—State Hy. Dpt., Harrisburg, concrete paving 33,892 sq.yd. Snyder Co., to J. Miller Eshelman, Landisville, $73,332—grading, concrete paving 5,000 sq.yd. Schuylkill Co., to H. J. Williams Co., Inc., York, $39,825—13,362 sq.yd. Northampton Co., to Graham Constr. Co., Woolworth Bldg., Lancaster, $36,140—67,686 sq.yd. Beaver Co., to Holmes Constr. Co., Wooster, O., $214,059—grading, macadam paving 40,005 sq.yd. Huntingdon Co., to A. A. White, Inc., Lebanon, $106,762. Grand total $470,109. Noted June 18.

Pennsylvania—State Hy. Dpt., Harrisburg, grading, waterbound macadam paving 53,530 sq.yd. York Co., to D. L. Risser, Lebanon, $91,592—77,008 sq.yd. Wayne Co., and 31,530 sq.yd. Susquehanna Co., to Richard Hopkins Co., North Pearl St. and Loudenville Rd., Albany, N. Y., $152,840 and $63,020 respectively—43,360 sq.yd. Berks and Schuylkill Counties, to H. H. Miller Co., Lancaster, $122,683—grading, 8 in. rein.-con. paving 5,241 sq.yd. Berks Co., to Dominic Maurer & Sons, Summit St. and Morgantown Rd., Reading, $14,234. Grand total $444,369. Noted June 18.

Virginia—State Hy. Comn., Richmond, topsoiling 31,434 cu.yd. Martinsville Rd., Route 12, Project F-450-A1, Henry Co., to Baskerville & Haskins, McKenney, $31,088.

Washington—S. J. Humes, dir. Hys., Olympia, improving 2.341 mi. Oreille Co., to Tucker Bros. & Scott, Kalispell, Mont., $64,441—1.657 mi. Okanogan Co., to Lidral-Wiley, Inc., 709 Securities Bldg., Seattle, $40,873 — 47.6 mi. Wahkiakum, Cowlitz, Lewis and Pacific Counties, to Diesel Oil Sales Co., 115 Belmont Ave. N., Seattle, $20,259—36.1 mi. Whitman Co., to Standard Paving Co., 603 Chronicle Bldg., Spokane, $85,105—93.4 mi. King and Kittitas Counties, to Hargrave Constr. Co., 418 West 20th St., Spokane, $64,810—0.607 mi. Pacific Co., to Harbor Sand & Gravel Co., Inc., Aberdeen, $14,397. Grand total $289,885. Noted June 25.

Wash., Seattle—Bd. P. Wks., paving, street lights on North Bway. et al., to Goetz & Brennan, Seaboard Bldg., Type A granite posts, $90,738. Noted Apr. 9.

Wisconsin—State Hy. Comn. and Hy. Coms. of Washington, Dodge, Sauk, Columbia Counties, Madison, constructing Cashton-Reedsburg Rd., to Lex Constr. Co., West Allis, $56,231—Portage-Endeaver Rd., Columbia Co., to Quinn Constr. Co., Madison, $108,052—West Co. Line-Addison Rd., Washington Co., to Goodearle & Raemisch, Dane, $10,969 — Columbia-Beaver Dam Rd., Dodge Co., to Burch Constr. Co., Madison, $27,904. Grand total $203,156. Noted June 18.

Wis., Madison—Dane Co., to P. Berg, Cambridge, graveling 2.39 mi. road in Christiana, $1,536; 3.75 mi. County Trunk B-N, $920; 3.5 mi. Pleasant Springs, $7,409; 1.51 mi. Pleasant Springs $3,226; 4.85 mi. in Cottage Grove, $3,662; 4.5 mi. Dunkirk, $4,048—to E. F. Gallagher, Oregon, 1.24 mi. road in Pleasant Springs $1,940; 1.18 mi. Pleasant Springs, $1,513; 1.54 mi. Albion, $930; 2 mi. Albion, $1,290; 1.2 mi. Pleasant Springs, $1,303; 5.13 mi. Pleasant Springs, $1,409; 1.51 mi. Pleasant Springs, $2,653—to J. F. Thorpe, Delavan, 1 mi. County Trunk T, $256; 4.5 mi. S.T.H. 73, $1,860—to F. Kutzke, Brooklyn, 4.85 mi. Town of Cottage Grove, $5,239; 1.54 mi. Albion, $1,313; 2 mi. Albion, $1,462—to Goodearle & Raemisch, Dane, 2.39 mi. Christiana Rd., $3,974—to W. Rees, Delafield, 3.6 mi. road, York, $2,928—to E. Ehler Co., Stoughton, 8.8 mi. in Medina, $6,455. Grand total $54,533.

Wis., Milwaukee—To Sczerwinski Constr. Co., South 16th St. and West Morgan Ave., paving North 42nd St. $1,337—to Blech Constr. Co., 930 North 38th St., North 24th Pl. $17,035; North 69th St. $16,291; North 72nd St. $30,438; West Center St. $35,645—to Bodemann Constr. Co., 2803 North 55th St., West Auer Ave., $4,500. Grand total $105,301.

Ont., Ayr—S. Cassells, clk. Waterloo Co., Court House, Kitchener, concrete paving 15,241 sq.yd. Stanley, Bruce and Jedburgh Sts., to P. Bergman, 128 King St. N., Waterloo.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ill., East St. Louis—East Side Levee Sanitary Dist., 217 Metropolitan Bldg., will not construct diversion Cahokia Creek, incl. outlet to Mississippi River. $1,900,000. E. F. Harper, c/o owner, ch. engr. Noted Dec. 11.

O., Cleveland—City, D. E. Morgan, mgr., stone breakwater wall at East 140th St. at Lake Erie for proposed sewage disposal plant. G. B. Sowers, City Hall, engr.

Tex., Bronte — Colorado River Irrigation Comn., surveys irrigating 75,000 acres. $650,000. Municipal Eng. Co., Athletic Bldg., Dallas, engrs.

BIDS ASKED

Calif., Los Angeles—Supervs. Los Angeles Co., taking bids 8,500 lin.ft. pile and wire revetment on San Gabriel River from Anaheim-Telegraph Rd. to East St. (1) piling to be driven with drop hammer and (2) piling to be driven with steam hammer.

Calif., Los Angeles—Supervs. Los Angeles Co., taking bids improving Los Angeles River Channel, involving enlarging and guniting channel from Laurel Canyon Blvd. to Laurel Grove Ave., incl. 29,000 cu.yd. excav. (levees incl. all trimming complete), 153,000 sq.ft. guniting channel slopes, complete, 38,000 sq.ft. pre-cast concrete block toe mat, complete, incl. first trim, 20. cu.yd. rein.-con. for construction cut-off walls and miscellaneous rein.-con. structures.

Calif., Los Angeles—Bd. Comrs. Los Angeles Co. taking bids excavating channel and constructing rock and wire mattress of Santa Ana Wash from Foothill Blvd. to Sierra Madre Storm drain, Proposal 1, 7,750 cu.yd. excav. of channel complete, 6,000 lb. place metal drainage culverts; Proposal 2, 60,400 sq.ft. construction of wire mattress; Proposal 3, 7,750 cu.yd. excav. channel complete, 6,000 lb. place metal drainage culverts, 60,400 sq.ft. construction rock and wire wattress. E. C. Eaton, ch. co. flood control engr.

La., Shreveport—Aug. 5, by Caddo Levee Dist., 26,000 cu.yd. Thompson Levee-Red River, right bank; 53,200 cu.yd. Glycerine Bayou Levee-Red River, right bank; 51,500 cu.yd. Long Point Levee-Red River, right bank.

Bond Elections

Coming Bond Elections

Waterworks Impvts.—Maryville, Mo., $50,000. W. B. Rollins & Co., Kansas City, Engr.
Sewerage System—Decoto, Calif., $25,000.
Viaduct for Grade Elimination — Beaumont, Tex., July 28, $900,000.
Natural Gas System — Erick, Okla., July 31, $25,000. F. F. Cordell, Engr.

Bonds Voted

Waterworks Impvts.—Prescott, Ariz., $200,000. A. J. Kline, City Engr.
Waterworks, Deep Well System—Cassville, Mo., Shockley Engr. Co., Kansas City, Mo., Engr., $12,000.
Water Supply—Phoenix, N. Y., $25,000.
Waterworks—Ashland City, Tenn. A. McCalla, Fayetteville, Engr. $30,000.
Waterworks—Smithfield, Utah. Engineer not appointed. $50,000.
Sewerage System—Tuscaloosa, Ala., $150,000.
Drainage System and Park Impvts.—Great Bend, Kan., $224,613.
Power Plant—Lenox, Iowa, $100,000.

Bonds Defeated

High School—Pocatella, Idaho, $350,000.
High School—Buffalo, Wyo., $175,000.
School—Jonesboro, La., Jackson Parish School Bd. W. C. Clendon, Secy. $150,000.

FEDERAL GOVERNMENT

PROPOSED WORK

D. C., Wash.—OFFICE, etc.—War Dpt., retained Holabird & Root, archts., 333 North Michigan Ave., Chicago, Ill., and H. W. Corbett, archt., 130 West 42nd St., New York, to make preliminary sketches and studies administration and office buildings.

Fla., Key West — BREAKWATER — Spec. 6533 — Yards & Docks, Navy Dpt., improving breakwater.

Ill., Joliet—WALLS—U. S. Eng., Chicago, masonry walls through Brandon Road Lock and Dam Pool.

Ky., Louisville — DAM — U. S. Eng. 14,000 yd. rock and 1,000 yd. lower approach to Auxiliary Lock Dam 41, Ohio River.

N. J., Bloomfield—POST OFFICE—Treas. Dpt. at office Sup. Archt., bids in October general contract 1 story, basement, brick, steel. $150,000 or more. W. O. Bartlett, 11 Raymond Blvd., Newark, archt. Noted June 11.

N. J., New Brunswick—DREDGING—U. S. Eng., New York, dredging 53,000 yd. and 34,700 yd. rock removal in Raritan River, near here.

Ore., Portland—STONE—U. S. Eng., 700,000 tons stone South Jetty Columbia River.

Pa., Pittsburgh—LOCKKEEPERS HOUSES—U. S. Eng.; 2 lockkeepers houses, Sashield, Lock and Dam, Ohio River.

BIDS ASKED

Ala., Montgomery—BOILER PLANTS—Aug. 11, by Con. Q.M. Maxwell Field, boiler plants, outside distribution system, steam conduit drains, at Maxwell Field; adv. E.N.-R. July 23.

Arkansas—EARTHWORK—July 29, by U. S. Eng., P. O. 667, Vicksburg, Miss., 50,000 cu.yd. earthwork on south bank Arkansas River.

Ark., Little Rock—POST OFFICE, etc.—Aug. 17, by Treas. Dpt. at office Sup. Archt., U. S. Post Office, Court House, etc.; adv. E.N.-R. July 23. Noted July 2.

Ark., Stuttgart—POST OFFICE—Aug. 17, by Treas. Dpt. at office Sup Archt., U. S. Post Office; adv. E.N.-R. July 23. Noted Dec. 4.

Arizona—ROAD—July 28, by Pub. Rds., Phoenix, grading 6.432 mi. Pine-Winslow Natl. Forest Rd., Coconino Co. C. H. Sweetser, 802 Title & Trust Bldg., Phoenix, dist. engr.

California — ROADS — Aug. 11, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 10.191 mi. Sect. A, Route 70, Idyllwild-Desert Natl. Forest Hy., Riverside Co.

Florida—CHANNEL—U. S. Eng., Jacksonville, bids about Aug. 1, 6 mi. levee and navigation channel, along south shore Lake Okeechobee between Moore Haven and Clewiston.

Fla., Key West—EXTENDING, etc.—Aug. 5, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Marine Hospital; adv. E.N.-R. July 23.

Ill., Carrollton—POST OFFICE—Aug. 13, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. July 23. Noted May 14.

Ill., Chicago—ELEVATORS—Aug. 10, by Treas. Dpt. at office Sup. Archt., elevators in U. S. Post Office.

Ill., Havana—POST OFFICE—Aug. 11, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. July 23.

Ill., Mendota—POST OFFICE—Aug. 12, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. July 23.

Ia., Sioux City—PILING DIKES—July 31, by U. S. Eng., 611 Insurance Exch. Bldg., 2,200 lin.ft. piling dikes in Missouri River, at Big Sioux Bend; adv. E.N.-R. July 23.

Kan., Brinkley—POST OFFICE—Aug. 10, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

La., Shreveport—ROOFING—Aug. 3, at office Con. Q.M., Barksdale Field, roofing on quartermaster building at Barksdale Field; adv. E.N.-R. July 23.

Missouri—BANK PROTECTION—Aug. 4, by U. S. Eng. Office, Memphis, Tenn., 5,000 lin.ft. bank protection in Mississippi River, vicinity of Island 18, just above Cottonwood Point; adv. E.N.-R. July 23.

Missouri, Arkansas and Tennessee—DIKES—July 29, by U. S. Eng., 1006 McCall Bldg., Memphis, Tenn., 4,200 ft. at Ruddle Point vicinity, Mo.; 1,300 ft. Keyes Point Bar vicinity, Tenn; 10,300 ft. Redman Point vicinity, Arkansas and Tennessee.

N. J., Paterson—POST OFFICE—Treas. Dpt. at office Sup. Archt., bids about Sept. 15, general contract 2 story, basement, brick, steel, Ramapo Ave., Market and Straight Sts. $500,000. F. W. Wentworth & F. J. Vreeland, 140 Market St., archts. Noted June 18.

N. Y., New York—REPAIRING—July 24, by Treas. Dpt. at office A. B. McCulloch, sup. ch. engr., U. S. Pub. Buildings, 731 U. S. Custom House, repairing elevator cable sheaves at U. S. Custom House.

N. Y., New York—TEST BORINGS—Aug. 5, by U. S. Eng., 39 Whitehall St., 200 test borings along centerline of proposed New York Bay-Delaware River Sect. Intracoastal Waterway; adv. E.N.-R. July 23.

Pa., Carlisle Barracks—BARRACKS—Aug. 11, at office Con. Q.M., constructing barracks; adv. E.N.-R. July 23.

S. C., Ezell—MONUMENT—Aug. 17, at office Con. Q.M., Fort Bragg, N. C., monument at Cowpens Battlefield; adv. E.N.-R. July 23.

Tennessee and Mississippi—PILE DIKES—July 30, by U. S. Eng., 1006 McCall Bldg., Memphis, Tenn., 5,600 ft. below Island 35 vicinity, Tenn.; 3,800 ft. head of Vice President's Island, vicinity, Tenn; 4,800 ft. above Island 63 vicinity, Miss.

Tex., Brownsville—POST OFFICE—Aug. 14, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Mar. 12.

Va., Yorktown—GRANDSTANDS—July 29, by O. G. Taylor, engr. in charge, Colonial Natl. Monument, grandstands and seats for United States-Yorktown Sesquicentennial Assn., Inc.

Washington—EARTHWORK, etc.—Aug. 21, by Dpt. Interior, Bureau Reclamation, Ellensburg, earthwork, structures on North Branch Canal Lateral System, Wippel Pump, Gravity and Turbine Laterals, Kittitas Div., Yakima Project; adv. E.N.-R. July 23.

Wyo., Newcastle—FEDERAL—Treas. Dpt. at office Sup. Archt., sketches federal building. $60,000.

CONTRACTS AWARDED

Colorado—ROAD—Pub. Rds., Custom House, Denver, grading 7.827 mi. Willow Creek Pass Natl. Forest Hy., Arapahoe Natl. Forest, Grand Co., to Pioneer Constr. & Eng. Corp., Denham Bldg., Denver, $58,868. Noted July 2.

D. C., Wash. — HOSPITAL — Dpt. Interior, Tuberculosis Building 1, St. Elizabeth's Hospital, to W. P. Rose Co., Goldsboro, N. C., $185,000. Noted Apr. 9.

Ga., Monroe—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J. C. Miller, Campbellsville, Ky., $39,658. Noted June 25.

Ga., Rossville—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J. C. Miller, Campbellsville, Ky., $42,036. Noted June 18.

Ga., Sandersville — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to C. A. Morrison, Shelby, N. C., $39,313. Noted June 25.

Ga., Thompson—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to C. A. Morrison & Son, Shelby, N. C., $371,313. Noted June 18.

Ga., Toccoa—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J. C. Miller, Campbellsville, Ky., $38,603. Noted June 25.

Ga., Waynesboro — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J. C. Hiller, Campbellsville, Ky., $40,350. Noted June 25.

Ill., Cairo—PILING—U. S. Eng. McCall Bldg., Memphis, Tenn., 4,400 sticks piling rafted together in water at site improvement in Ashport-Gold Dust Reach, near here, to L. O. Brayton Eng. Co., Dyersburg, Tenn., $20,848. Noted June 19.

Ill., Cicero—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to V. Chiabai, Gary, Ind., $104,900. Noted May 21.

Ind., Lafayette—POST OFFICE—Treas. Dpt. at office Sup. Archt., 2 story, basement, brick, rein.-con. federal building, to J. A. Tintari, 22 Illinois St., Chicago Heights, Ill., $245,760. Est. $315,000. Noted June 4.

Ind., Vincennes — MEMORIAL — George Rogers Clark Sesquicentennial Comn., at office F. H. Hirons and F. W. Mellor, archts., 40 East 49th St., New York, for George Rogers Clark Memorial Building, to W. R. Heath Constr. Co., Greencastle, $773,800. Noted June 8.

Ia., Marengo—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Phelps-Drake Co., 711 Metropolitan Life Bldg., Minneapolis, Minn., $46,700. Noted June 11.

Ky., Louisville—POST OFFICE—Treas. Dpt. at office Sup. Archt., general contract U. S. Post Office, to Pike & Cook, 416 South 5th St., Minneapolis, Minn., $1,507,700. Noted May 28.

Louisiana—EARTHWORK—U. S. Eng., Foot Prytania St., New Orleans, 420,000 yd. Popular Grove Levee, to Canal Constr. Co.; McCall Bldg., Memphis, Tenn., $49,686; 1,240,000 yd. Mississippi River Levee, to Grasser Contg. Co., Amer. Bank Bldg., New Orleans, $119,412; 140,000 yd., to J. L. Williams, New Orleans, $13,846; 4,920,000 yd., to W. E. Callahan Constr. Co., Arcade Bldg., St. Louis, Mo., $781,296; 4,280,000 yd., to Trinity Farm Constr. Co., Irving Texas Bldg., Dallas, Tex., $704,060. Grand total $1,668,300. Noted June 25.

La., New Orleans — EARTHWORK — U. S. Eng., foot Prytania St., 570,000 cu.yd. earthwork in Hard Time-St. Joseph Levee, to W. E. Callahan Constr. Co., Arcade Bldg., St. Louis, Mo., at $0.15884 per cu.yd. Noted June 11.

Me., Augusta—WAREHOUSE, etc.—U. S. Disbursing Officer, Camp Keys, warehouse, bath, water and sewer extension, to V. E. Dunn, 155 Sewell St., $1,000 and $4,200 respectively; water system and boilers, to P. P. Carey, 57 Summer St., Waterville, $3,551 and $834 respectively. Grand total $8,585. Noted June 24.

Mass., North Truro—STATION—U. S. Coast Guard, 2 story station building, at Guard Station, Highland Coast, to Valeri & Koslow Constr. Co., 186 Scituate St., Arlington, Est. $25,000. Noted June 18.

Michigan—DREDGING—U. S. Eng., Detroit, in Pond Island Shoal 1, St. Mary's River, to Great Lake Dredging & Dock Co., 104 South Michigan Blvd., Chicago, Ill., $220,605. Noted June 11.

Nev., Boulder City—STREETS, etc.—Bureau Reclamation, Las Vegas, street, alley, parking area, sidewalk, grading, paving, etc., in Boulder Canyon Project, Arizona-California-Nevada, to New Mexico Constr. Co., Albuquerque, N. M., $273,972. Noted June 4.

New Jersey—DREDGING—Treas. Dpt. at office Sup. Archt., 454,000 cu.yd. Washington Canal and South River, to Trimont Dredging Co., Boston, Mass., $53,844. Noted June 11.

Pa., Erie—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 and 2 story, basement, to Coath & Goss, 1549 Randolph St., Chicago, Ill., $281,225. Noted July 2.

Tenn., Memphis—RIPRAP STONE—U. S. Eng., Memphis, 55,000 cu.yd. revetment work in Mississippi River, to Barrett Line Co., Inc., Chamber of Commerce Bldg., Cincinnati, O., $122,750.

Tex., Fort Worth—POST OFFICE—Treas. Dpt. at office Sup. Archt., general contract, 2 story, basement, mezzanine, 269 x 311 ft. Post Office, Lancaster St., to Ralph Sollitt & Sons Constr. Co., 2543 South Michigan Ave., Chicago, Ill., $1,017,000. Noted June 4.

Tex., Randolph Field—SPRINKLER SYSTEM—Con. Q.M. sprinkler system for Randolph Field, to N. A. Saigh Co., c/o Builders Exch., San Antonio, $17,500.

Tex., San Antonio—HANGAR—Con. Q.M. two 90 x 140 ft., steel hangars, Duncan Field, near here, to K. L. Colburn, Pasadena, Calif., $59,463. Noted June 4.

Federal Government Work (Continued)

Vt., Rutland—ELEVATOR—Treas. Dpt. at office Sup. Archt., passenger elevator in U. S. Post Office, to F. S. Payne Co., 75 Richdale Ave., Cambridge, $13,430. Noted Apr. 2.

W. Va., Huntington—HOSPITAL—Vet. Bu., Arlington Bldg., buildings, utilities, to Worsham Bros., Knoxville, Tenn., $509,207. Noted May 21.

Wyoming—ROAD—Pub. Rds., Custom House, Denver, Colo., grading 5.225 mi. Centennial-Saratoga Natl. Forest Hy., Albany and Carbon Counties, to Morrison Knudson Co., 319 Bway., Boise, Idaho, $80,111. Noted July 2.

RAILWAYS

PROPOSED WORK

Illinois—Chicago, Burlington & Quincy R.R., A. W. Newton, ch. engr., 547 West Jackson Blvd., Chicago, surveys 54 mi. double-track standard gage railroad from point on main line near Centralia to East St. Louis. $4,000,000.

BIDS ASKED

Colorado—See "Contracts Awarded."

Oklahoma—July 27, by H. W. Wagner, ch. engr. (eastern lines) Atchison, Topeka & Santa Fe R.R. Co., Topeka, Kan., concrete work, drainage, general construction work for track elevation in Oklahoma City Yards. $1,000,000. Noted July 16.

CONTRACTS AWARDED

Colorado—Atchison, Topeka & Sante Fe R.R. Co., G. W. Tarris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., installing automatic block signal system between Pueblo and LaJunta, day labor.

SUBWAYS AND TUNNELS

BIDS ASKED

Pa., Phila.—July 28 by Dpt. City Transit, C. E. Myers, dir., City Hall Annex, Contr. 250, Market St. Subway, pedestrian concourse, south side of 12th St.

GRADE CROSSINGS

PROPOSED WORK

Mass., Groton—Boston & Maine R.R. Co., W. J. Backes, ch. engr., 150 Beverly St., Boston, concrete, steel overhead bridge 1 mi. west of here. $25,000 or more.

BIDS ASKED

Mass., Quincy — New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., and City, bids about Aug. 1, abolishing Quincy Adams Crossing, and constructing 200 ft. steel, concrete bridge, Water St. $700,000.

New York—Aug. 7, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, completing construction stone faced rein.-con. undercrossing at intersection of Ossining and Manville Rds., Saw Mill River Parkway, in Pleasantville and Mount Pleasant, Contr. 324-A. J. Downer, Bronxville, ch. engr.; adv. E.N.-R. July 23.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co., abutments, concrete deck for 1 span 77 ft. steel, rein.-con. plate girder bridge over Southern Pacific R.R. at Victory Pl., to F. F. Greenfield Co., 7310 South Figueroa St., $25,997. Est. $34,272.

Ont., Orillia—Dpt. P. Hys., Parliament Bldgs., Toronto, A. A. Smith, engr., rein.-con. overhead hy. bridge, incl. 90,000 cu.yd. fill, near here, to John Patterson Constr. Co., Brampton. Est. $75,000.

DAMS

PROPOSED WORK

Calif., Los Angeles—See "Equipment."

Tex., San Benito — International Waters Comn., preliminary plans storage dam system between here and Big Bend. $10,000,000.

Alta., Calgary—Calgary Power Co., storage dam on Upper Kananasakis River. $100,000.

PIERS AND WHARVES

PROPOSED WORK

Mass., Dartmouth—PIER—A. L. Chubb, Mishaum Point, S. Dartmouth, stone timber pier at Mishaum Point. $25,000. Private plans.

N. Y., Charleston (sta. Staten Island)—PIER—Standard Oil Co. of New York, 26 Bway., New York, 226 ft. timber pier with timber pile work clusters. $25,000. Project in abeyance until about December. Noted Apr. 23.

AIRPORTS

PROPOSED WORK

Okla., El Reno—City will not build airport. Project abandoned. Noted Feb. 26.

BIDS ASKED

Mo., St. Louis—See "Sewers."

Tex., Beaumont—City, c/o P. Millard, mgr., taking bids 80 x 106 ft., steel, rein.-con., galvanized iron hangar. Irby & Woodside, 1020 Goodhue Bldg., archts. R. C. Black, c/o City Hall, engr. Noted June 16.

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CONTRACTS AWARDED

Okla., Oklahoma City — City, administration building at airport, to Secor & James, 519 West Main St., Oklahoma City, $53,000. Est. $56,000.

POWER AND LIGHTING

BIDS ASKED

N. Y., Brooklyn—Aug. 4, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, constructing connecting conduits between Shaft 23 of City Tunnel 1 and Shaft 16-A, of City Tunnel 2, 3rd Ave., Schermerhorn, Nevins and State Sts.; adv. E. N.-R. July 23.

N. Y., New York—July 28, by Park Bd., W. J. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, installing lighting fixtures in recreational buildings, in McComb's Dam Park extension, Bronx Boro, and 5 greenhouses in Central Park opposite East 104th St., Manhattan Boro.

PARKS AND SPORTS

PROPOSED WORK

N. J., Elizabeth—Bd. City Comrs., City Hall, concrete, tile swimming pool, Elmora and Jersey Aves. $25,000. Enginer not appointed.

N. Y., Brooklyn—Ice Palace Corp., 393 7th Ave., New York, will not build ice skating pavilion, 588 Flatbush Ave. $275,000. Project abandoned. Noted Sept. 18.

N. Y., Brooklyn—Long Island Storage Warehouse, Inc., Nostrand and Gates Aves., 84 x 130 ft. ice skating rink, refrigeration, stores, Coney Island Ave. and Ocean Parkway. $150,000. H. G. Wiseman, 33 West 42nd St., New York, archt. **Maturity about Dec. 1.** Noted July 9.

N. Y., New York—University Club, 1-3 West 54th St., bids about September, general contract altering roof for squash courts, golf driving school and sports gallery, 1 West 54th St. $30,000. McKim, Mead & White, 101 Park Ave., archts. Noted June 25.

N. Y., White Plains — Saxonwood Club, Mamaroneck Ave., swimming pool. To exceed $40,000. Project in abeyance until late in winter or spring. Noted June 18.

W. Va., Chester—Idlewild Manageemnt Co., J. McDonald, chg., Rock Springs Park, soon lets contract 75 x 100 ft. swimming pool and filtration plant, incl. chlorinator.

CONTRACTS AWARDED

Calif., Berkeley—Bd. Regents University of California, rein.-con. track stadium bowl, 20,000 seating capacity, to C. D. DeVilbiss, 369 Pine St., San Francisco, $239,775. Noted June 25.

Mass., Litchfield—Springhill School, North St., 1 story, timber gymnasium, auditorium, North St., to Torrington Building Co., 182 Church St., Torrington, Conn. Est. $25,000.

N. Y., New York—Fordham Methodist Episcopal Church, 2543 Marion Ave., sports, gymnasium, to D. P. Roberts, 175 5th Ave. Est. $25,000. Noted July 9.

N. Y., New York—Park Bd., W. R. Herrick, Pres. Park Dpt., Arsenal Bldg., Central Park, general contract golf house and comfort station, Mosholu Links, to A. Spadaro, Inc., 724 East 225th St., $29,871; plumbing, to Reuben Isaacson, 41 West 96th St., $5,493; heating to Murphy & Beamont Co., 303 West 42nd St., $3,900. Grand total $74,364. Noted June 18.

HEATING AND VENTILATING

BIDS ASKED

Mass., Gardner — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, taking bids new heating plant at hospital at State Colony. $150,000. A. B. Franklin, Inc., 25 Haverhill St., Boston, engrs. Noted June 4.

N. Y., Annadale (sta. Staten Island)—July 28, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, plumbing, drainage heating, ventilating, electrical work, lighting fixtures, P. S. 36, Jefferson Blvd., from Ionia to Lamont Aves., Bd. Educ., 500 Park Ave., New York.

UNCLASSIFIED

PROPOSED WORK

Colorado — PIPE LINE — Colorado Gas & Utilities Co., c/o H. A. Salter, genl. mgr., Lamar, preliminary surveys 6 mi. gas line from Hartman to Bristol.

Tex., Center—STORAGE TANKS—Magnolia Petroleum Co., 1009 Fannin St., Houston, and 227 Bway., San Antonio, preliminary plans 14 steel storage tanks, probably 50,000 or 80,000 bbl. capacity each. $1,400,000. Private plans.

Wash., Aberdeen—TELEPHONE SYSTEM—Pacific Telephone & Telegraph Co., extending service 33 mi. from Lake Quinault to Kalalock. $40,000; reconstructing 9.4 mi. line from Touchet to Wallula, $47,000.

BIDS ASKED

Mass., Boston—BOILER BRICKWORK, etc.—July 20, by Dpt. School Buildings, 11 Beacon St., boiler brick work in various schools, Sects. A, B, C and D, $25,000 or more; new boilers and settings in Longfellow School; manholes, manhole plates, covers, etc., for steam boilers in various schools, Sects. A and B, $25,000 or more.

N. Y., Geneva—ELEVATOR—Aug. 6, by Commissioner Dpt. Educ., Educ. Bldg., Albany, electric elevator, Horticultural Building, New York State Agricultural Experiment Station; adv. E.N.-R. July 23.

N. Y., Kings Park—Aug. 5, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work, dining and kitchen building and electric elevators in Buildings 1 and 2, Kings Park State Hospital; adv. E.N.-R. July 23.

N. Y., Kingston—FOUNDATION PILING—July 30, by Adjutant General Div. Military & Naval Affairs, Executive Dpt., Capitol, Albany, found. piling, State Armory for Field Artillery; adv. E.N.-R. July 23.

N. Y., New York—ELEVATOR—See "Contracts Awarded."

N. Y., New York — ELEVATOR, etc. — H. Hohauser, archt., 1431 Bway., taking bids on revised plans elevator, plumbing, heating alterations, for DeFrance Hotel, for National Club Hotels, 535 5th Ave. $50,000.

CONTRACTS AWARDED

Calif., San Francisco—PIER—City and San Francisco Co., B. P. Lamb, secy. Park Comn. (1st unit) recreation pier at Aquatic Park, incl. rein.-con. pile pier with 300 ft. concrete deck, 60 ft. wide at foot Van Ness Ave., to Healy-Tibbitts Constr. Co., 64 Pine St., $92,570. Noted June 25.

Mass., New Bedford—PLATFORM—Dpt. P. Wks., State House, Boston, creosoted pile, timber platform at State Pier, to F. C. Taylor, 87 Middle St., for Commonwealth of Massachusetts, State House, Boston. Est. $50,000.

N. Y., New York—ELEVATOR, etc.—W. F. Chatles, 369 Lexington Ave., elevator, plumbing, heating for showroom and office, 363 Lexington Ave., separate contracts. $40,000. L. F. Knust, 369 Lexington Ave., archt. Noted Apr. 23.

N. Y., New York — TREATED TIES — Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., treated ties, etc., Order 16, to Atlantic Creosoting Co., 17 Battery Pl., $99,966. Noted July 2.

N. Y., Rochester — QUAY WALL — See "Public."

Pa., Johnstown — RETAINING WALL — Bd. Educ., J. D. Rutledge, pres., Central High School, 500 to 620 ft. counterfort type retaining wall, at rear of school along channel line of Stoney Creek River, guard rail, ft. excavation of river to establish grades, removing surplus material, to Union Eng. & Constr. Co., 1414 Investment Bldg., Pittsburgh, $36,600. Noted June 4.

R. I., Providence—PLUMBING—State, County Coms., installing plumbing system in new court house, Benefit and College Sts., to American Plumbing Co., 205 South Main St., $31,600. Noted June 11, under "Public."

MATERIALS

PROPOSED WORK

GALVANIZED PIPE—**Lakeport, Calif.**—City purchasing 1,800 ft. 2 in. galvanized pipe for water extensions.

PORTLAND CEMENT—**Syracuse, N. Y.**—A. Cane, purch. agt., Onondaga Co., soon takes new bids 20,000 bbl. cement. Former bids rejected.

BIDS ASKED

CEMENT, etc.—**Mobile, Ala.**—Aug. 10, at Mobile Co. Courthouse, 260 bbl. portland cement, 150 cu.yd. gravel, 100 cu.yd. sand, for Paving Impvt. 10 between Bayou La Batre and Irvington. E. D. Laurendine, chn.

CEMENT—**Los Angeles, Calif.**—Supervs. Los Angeles Co. taking bids 2,500 bbl. cement (in cloth sacks), for precast concrete blocks in Los Angeles River.

CEMENT — **Los Angeles, Calif.** — Supervs. Los Angeles Co. taking bids 2,180 bbl. cement in connection with 8th St. storm drain at San Fernando.

BITUMINOUS or TAR — **Newport, Ind.** — July 27, by Comrs. Vermillion Co., W. A. Rein, aud., 10,000 gal. more or less bituminous or tar T. C. or T. M., f.o.b. Clinton.

BRIDGES FLOORING—**Newport, Ind.**—July 27, by Bd. Comrs. Vermillion Co., W. A. Rein, aud., Court House, 8,000 sq.ft. creosoted bridge flooring, 4 in. thickness, 20 ft. length.

GRAVEL—**Carroll, Ia.**—July 27, at office Auditor Carroll Co., 4,000 cu.yd. gravel, 2,000 cu.yd. Class A gravel. J. F. Maher, Carroll, co. engr.

BITUMINOUS TAR MATERIAL—**Cleveland, O.**—July 24, by Bd. Comrs., Cuyahoga Co., 100,000 gal. bituminous tar material. $19,000. F. Williams, Court House, engr.

CONTRACTS AWARDED

PORTLAND CEMENT—**Sacramento, Calif.**—State, furnishing cement to State Harbor Comn., at San Francisco, during year beginning July 1, 1931, to Calaveras Co., San Francisco, at $2.25 bbl. $0.10 return for sacks 2% cash, 10th proximo.

CEMENT — **San Francisco, Calif.** — See "Bridges."

Materials (Continued)

PIPE—**St. Louis, Mo.**—N. L. Weston, supply comr., City Hall, 16,000 ft. 20 in. mono cast iron pipe, for Water Dpt., to American Cast Iron Pipe Co., 2930 North 16th St., Birmingham, Ala., and St. Louis, Mo., at $3.30 per ft. Noted June 29.

STEEL—**New Jersey**—Pennsylvania R.R. Co., C. E. Walsh, agt., 15 North 32nd St., Phila., Pa., will fabricate structural steel at Altoona shops for transmission towers for power transmission from Newark to Trenton. Former bids rejected.

PORTLAND CEMENT—**Brooklyn, N. Y.**—H. Hesterberg, pres. Brooklyn Boro. Boro Hall, 4,000 bbl. cement, to General Builders Supply Co., 205 East 42nd St., New York, $8,160. Noted June 25.

ROAD OIL—**Pierre, S. D.**—State Hy. Comn., 450,000 gal. road oil, to White Eagle Oil Corp., Federal Reserve Bank Bldg., Kansas City, Mo., $23,509.

EQUIPMENT

PROPOSED WORK

PUMP, MOTOR, etc.—**Los Angeles, Calif.**—Supervs. Los Angeles Co., soon takes bids pump and motor complete, one 10 kva. gasoline-driven generator plant, automatic transfer switch complete, miscellaneous electrical equipment, flood lights, insulators, conduits, wire, receptacles, etc., for Big Tujunga Dam No.1. Noted June 11, under "Excavation, Drainage, Irrigation, Levees, River and Harbor."

PUMPING PLANT — **Merced, Calif.** — City drilling well and installing pumping plant at Bear Creek Park. $1,400.

BIDS ASKED

TRACTORS, etc.—**Oroville, Calif.**—Butte Co. in market 2 tractors and 7 motor trucks. $15,000 or more. J. A. Bumgarner, Oroville, co. engr.

TRUCKS, etc.—**Indianapolis, Ind.**—July 24, by Ppt. Pub. Purchase, City Hall, A. H. Losche, purch. agt., 2 service and 2 Packard trucks, 1 chassis, 1 eductor, one 1,000 gal. road oil distributor, 1 chassis with cab complete; 2 ton dump truck.

BOILERS, etc.—**Muncie, Ind.**—Aug. 1, by Bd. Comrs. Delaware Co., at office W. M. Shafer, aud., furnishing, installing boilers, furnace stoker, breeching, piping, condensation pump. $5,000.

PUMP—**Baltimore, Md.**—July 29, by Bd. Awards, furnishing, delivering unwatering pump for Montebello-Druid Conduit. E. G. Rost, Municipal Bldg., water engr.

MACHINE SHOP EQUIPMENT — **Detroit, Mich.**—Superior Motor Rebuilding Co., 2325 Oakdale Ave., in market machine shop equipment.

FOREIGN

Egypt, Cairo — Sept. 1, by Dpt. P. Wks., Mechanical Branch, four 150 hp. marine diesel engines, gear and accessories for coal barges.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

N. Y., Brooklyn—See "Contracts Awarded".

N. Y., New York—Jere Holding Corp., c/o S. H. White, 461 West 44th St., soon takes bids general and separate contracts 6 story apartment, 461 West 44th St. $150,000. Private plans.

Pa., Erie—Shutts & Morrison, archts., 312 Marine Bank Bldg., taking bids 2 story, basement, 80 x 90 ft., brick, timber, steel. Lakeside Dr. and Lake Erie, for Sunset Hotel Co., c/o W. Moeller, 1990 Lakeside Dr. $150,000, incl. equipment.

CONTRACTS AWARDED

N. Y., Brooklyn—Edwin Construction Co., D. Elkins, pres., 1570 53rd St., 6 story, 90 x 100 ft., 14th Ave. and 52nd St., separate contracts. $165,000. Malkind & Weinstein, 93 Court St., archts.

N. Y., Brooklyn—H. Orlinsky, Inc., 295 East 3rd St., 6 story, 90 x 100 ft., 21st Ave. and 68th St., separate contracts. $175,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—L. Sorkin, 1714 East 16th St., 6 story, 80 x 200 ft., Hubbard St. and Brightwater Court, separate contracts. $300,000. I. Charin, 186 Joralemon St., archt.

N. Y., Brooklyn—Winthrop Street Corp., 191 Joralemon St., 6 story, 90 x 169 ft. apartment, Winthrop St. and Bedford Ave., separate contracts. $300,000. B. W. Dorfman, 66 Court St., archt.

CLUBS

PROPOSED WORK

N. J., New Brunswick—Beta Theta Pi, c/o Rutgers University, 3 story, basement, brick, steel fraternity house. $150,000. Project indefinitely in abeyance. Cherry & Matz, 441 Lexington Ave., New York, archts. Noted Apr. 28.

Pa., Erie—Meyer & Johnson, archts., Commerce Bldg., revised plans by Meyers & Johnson, Commerce Bldg., 7 story, 50 x 100 ft., brick, steel, rear addition to Y. M. C. A., 31 West 10th St. $350,000. Former bids rejected. Noted June 26.

W. Va., Wheeling — Wheeling Elks Home Co., 32 15th St., plans by E. B. Franzheim, 1425 Chapline St., F. F. Faris, 1117 Chapline St. and G. B. Cunningham, Pythian Bldg., 3 story, basement, brick, concrete, fabricated steel, Indiana sandstone, incl. 2 units, 1 main club building and other auditorium, ballroom, 15th St. $300,000.

CONTRACTS AWARDED

Pa., Harrisburg—Y. M. C. A., c/o National Bureau, 347 Madison Ave., New York, to S. W. Shoemaker & Son, Payne-Shoemaker Bldg., general contract for New Central Y, Front and North Sts., and Forster St. Branch, $3[illegible] and $82,750 respectively; to Herre Bros., 7th and Emerson Sts., heating $29,732 and $12,654 respectively, plumbing $24,285 and $10,875 respectively; to Davis & Son, 600 North 2nd St., electrical work, Central St. Y.M.C.A. $1[illegible] to Columbia Electric Co., 1235 Market St., electrical work in Forster Building, $4,597. Grand total $529,693. Awarded in June.

HOSPITALS

PROPOSED WORK

N. J., Lakeland—Bd. Freeholders Camden Co.; H. G. Gethers, chn. Finance Com., Court House, plans by Green & McNeely, 300 Bway, Camden, for Hospital for Mental Diseases; also new wing at General Hospital. $700,000.

Pa., Erie — Hamot Hospital, F. W. Brouitt, acting dir., 4 East 2nd St., hospital. East 2nd St. General contract bids in. Project indefinitely in abeyance. Crow, Lewis & Wick, 200 5th Ave., New York, archts. Noted June 11.

Pa., Warren—Warren State Hospital, H. W. Mitchell, supt., plans by W. T. Monahan, 608 Palace Hardware Bldg., Erie, state hospital, incl. dining hall to accommodate 800 patients $146,000; nurses home $91,500, laundry building addition $28,000. Noted July 9.

BIDS ASKED

Conn., Norwich—July 27, by Old Senate Chamber, State Capital, Hartford, 3 story, brick, steel infirmary, and 2 doctor's cottages, Uncas-On-Thames. $360,000. Cudworth & Thompson, Disco Bldg., archts.

Mass., Norfolk—July 30, by Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, 3 story, basement, brick, steel, concrete receiving building, $250,000; and 3 story basement, brick, rein. con., steel administration building, $150,000, both concrete founds., at State Prison Colony. McLaughlin & Burr, 88 Tremont St., Boston, archts. R. D. Kimball Co., 6 Beacon St., Boston, engrs. Noted July 16.

Mich., Eloise—July 30, by Superintendent of poor, Wayne Co., County Bldg., Detroit, altering and additions to convert 3 and 4 story, basement, brick, steel, stone, concrete infirmary into general hospital, plain found., Michigan Ave. $350,000. Maul & Lentz, 1259 David Whitney Bldg., Detroit, archts. Noted June 25.

Minn., Willmar—July 28, by State Comn. Administration & Finance Capitol, St. Paul, two 2 story, basement, stucco, dormitories, 1 story, 32 x 50 ft. power house extension, 1 story, 25 x 50 ft. laundry for State Asylum for Insane, $180,000. Long & Thorshov, 1028 Andrus Bldg., Minneapolis, archts.

N. Y., Pine Aire Station—Aug. 19, by Dpt. Mental Hygiene, State Office Bldg., Albany, constructing Buildings 16, 18, 19, 20, 36, 42, 43, 54, 57, 58, 59, 60, 61, 69, 70, 71 and 72, railroad shelter, salvage yard wall, service tunnels, altering and constructing additions to Buildings 35 and 37, Pilgrim State Hospital; adv. E.N.-R. July 23.

Oklahoma—July 27, by State Bd. Affairs, Capitol Bldg., Oklahoma City, 2 story, basement hospital for feeble minded, at Enid; 3 story, basement hospital for insane, Norman; 2 story, basement hospital at Taft; 3 story, basement hospital for insane, Vinita; 2 story, basement tuberculosis hospital at Supply. $150,000 each. Layton, Hicks & Forsythe, Capitol Bldg., Oklahoma City, archts.

Vt., Waterbury—Vermont State Hospital for Insane taking bids 2 story, basement, 50 x 150 ft. female ward building, brick, concrete, steel, plain found. $150,000. F. L. Austin, 240 College St., Burlington, archt. Noted Apr. 30.

CONTRACTS AWARDED

Wis., Sheboygan—Schmidt, Garden & Erickson, archts., 104 South Michigan Ave., Chicago, Ill., to Immel Constr. Co., Fond du Lac, general contract 5 story, 163 x 164 ft. hospital, for Sheboygan Hospital Assn., $124,831; to C. A. Honold Co., Sheboygan, plumbing $32,975, heating $43,526, electrical wiring $16,706; to South Side Hardware & Plumbing Co., Sheboygan, ventilating $7,325. Grand total $315,363. Noted May 7.

CHURCHES

PROPOSED WORK

N. J., Jersey City—St. John's Roman Catholic Church, P. W. Smith, pastor, 3026 Hudson Blvd., will not alter 2 story, basement, brick, steel, Hudson Blvd. and Van Winkle Ave. $150,000. Architect not appointed. Project abandoned. Noted June 11.

N. J., Jersey City — Westminster Presbyterian Church, H. L. Wyatt, pastor, 304 Academy St., revised sketches by W. Neuman, 26 Journal Sq., 2 story, basement, brick, steel, 302-04 Academy St. $250,000. Noted Apr. 9.

N. J., Newark—Italian Catholic Union Molding Co., c/o J. Centanni, archt., 142 Market St., soon lets contract 2 story, basement, 60 x 100 ft., brick, steel club, Summer Ave. and D'Auria St. $150,000. Noted May 14.

N. J., Perth Amboy—St. Michaels Church, c/o G. W. Brooks, archt., 216 Smith St., revised sketches 2 story, basement, brick, steel, Hull Ave. $200,000. Noted Jan. 29.

BIDS ASKED

N. J., Newark—W. B. Willis, archt., 111 Madison Ave., New York, bids about Aug. 15 or later, rebuilding 2 story, basement, brick, steel church, James and Washington Sts., to Second Presbyterian Church, 294 Mount Prospect Ave. $250,000. Noted July 9.

CONTRACTS AWARDED

N. Y., New York—Paulist Fathers, J. B. Harney, pastor, 6 story, basement, 100 x 170 ft. rectory, to J. J. McMahon, 40 East 49th St. Est. $150,000.

SCHOOLS

PROPOSED WORK

Mass., East Boston (sta. Boston)—City, Dpt. School Buildings, soon takes bids 2 story, basement, brick, limestone school, plain found., Chapman Dist. $200,000. Noted May 14.

Mass., Roslindale (sta. Boston)—City of Boston, Dpt. School Buildings, soon takes bids 2 story, basement, brick, stone school, plain found., Charles Sumner Dist. $200,000. W. W. Drummey, 80 Boylston St., Boston. Noted Feb. 5.

Mass., Roxbury (sta. Boston)—City of Boston, Dpt. School Buildings, soon takes bids 2 story, basement, brick, limestone school, plain found., H. L. Higginson Dist. $200,000. Fay, Spofford & Thorndike, 44 School St., Boston, archts.

N. J., Springfield — Bd. Educ., Short Hills, will not build 2 story, basement, brick, steel, rein.-con. high school, Flemer Ave. $200,000. Project abandoned. Noted Apr. 16.

N. J., West Orange — Bd. Educ., Northfield Ave., Junior High School, 3 story, basement, brick, steel, rein.-con., Gilbert St. $550,000. Project in abeyance. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted May 28.

N. J., Wilburtha—Dpt. Institution & Agencies, State Office Bldg., Trenton, recalled bids to have been opened July 17, 2 story, basement training school, gymnasium, swimming pool at State Police Barracks. $150,000. Will probably take new bids soon. Noted July 16.

BIDS ASKED

Ind., Campbellsburg—July 30 (extended date) by School Comrs., brick, steel high school. $150,000. O. L. Hill, Heitzer Bldg., Bedford, archt. Noted June 25.

Mass., Springfield—July 30, by City, C. J. Morrow, chn. building comn., 3 story, basement, irregular sized, brick, steel, concrete technical high school, Elliott St. $400,000. F. W. S. King and E. C. and G. C. Gardner, 33 Lyman St., archts. Noted June 18.

N. Y., Brooklyn—July 28, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., general contract P. S. 248, Avenue U, 86th St. from West 12th and West 13th Sts., for Bd. Educ., 500 Park Ave., New York. Noted June 18.

N. Y., Brooklyn—July 28, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., general contract P. S. 236, Avenue U from East 63th to East 64th Sts., for Bd. Educ., 500 Park Ave., New York. Noted Nov. 20.

N. Y., Ithaca—Aug. 20, by Commissioner Educ., Education Bldg., Albany, Home Economics Building, New York State College of Home Economics, Cornell University; adv. E.N.-R. July 23.

O., Cincinnati—July 27, by Crowe & Schulte, archts., 2436 Reading Rd., 4 story, basement, brick, rein.-con. physics building, plain found., campus, for University of Cincinnati, Clifton Ave. $400,000.

O., Hamilton—July 28, by Bd. Educ., 3 story, basement, brick, steel, concrete high school. $400,000. F. J. Mueller, Rentschler Bldg., and G. Barkman, 3rd and High Sts., archts. Noted Mar. 12.

Pa., Munhall—July 28, by Bd. Educ., L. J. Holman, pres., E. M. Cox, sec., Junior High School Bldg., 3 story, basement, brick, steel elementary and junior high school, Woodlawn Ave. and Charles St. $200,000. A. G. Wickerham, 135 East 8th Ave., Homestead, archt. Noted July 2.

Wash., Seattle—July 28, by Regents University of Washington, 3 story, 60 x 135 ft., rein.-con. oceanographic laboratory, campus. $225,000. J. Graham, Dexter Horton Bldg., archt. Noted June 18.

CONTRACTS AWARDED

Del., Milford—State School Building Comn., H. V. Holloway, supt., Dover, general contract 2 story, basement, brick, steel, grade and high school addition, plain found., to Hastings & Parsons, Salisbury, Md.; plumbing and heating, to T. T. Weldin & Sons, 916 Orange St., Wilmington; electrical work, to G. W. McCaulley & Son, 103 West 8th St., Wilmington. Est. $150,000. Noted July 9.

Del., Millsboro—State School Building Comn., Du Pont Bldg., H. V. Holloway, supt., Dover, general contract 2 story, basement, brick, steel addition, plain found., to Hastings & Parsons, Salisbury, Md.; plumbing and heating, to T. T. Weldin & Sons, 916 Orange St., Wilmington; electrical work, to L. W. Gunby, Salisbury, Md. Est. $150,000. Noted July 9.

Ind., La Porte—School Comrs., 2 story, basement, 78 x 217 ft., brick, rein.-con. high school, to J. Goodall, 1622 Michigan Ave. Est. $150,000. Noted June 11.

Ind., Wheatfield—School Comrs., general contract school, to H. A. Halpin, Momence, Ill. Est. $150,000. Noted June 11.

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Schools (Continued)

Mass., Boston—City of Boston. Dpt. School Buildings, 2 story, basement, brick, limestone, steel intermediate school, plain found., to Rugo Constr. Co., 80 Boylston St., Boston, $583,000. Noted Apr. 16.

Mass., Everett—City School Com., 2 story, basement, brick, limestone, steel addition to Junior High School, plain found., to Bond Bros., 79 Ferry St., $418,000. Noted Mar. 19.

Mass., Hamilton — Town, J. Lamson, chn. building com., 2 story, basement, 120 x 125 ft., brick, stone high school, to D'Amore Constr. Co., 89 State St., Boston. $150,000. Noted July 2.

Mass., Somerville (br. Boston)—St. Catherines Roman Catholic Parish, altering and constructing 3 story, basement, brick, stone convent addition, plain found., to F. S. Brennan, 40 Court St., Boston. Est. $150,000. Noted July 9.

Minn., Moorhead—State Comn. Administration & Finance, St. Paul, general contract 3 story, basement, 150 x 282 ft. and 120 x 140 ft. recitation and physical education building; 2 story, basement, 82 x 260 ft. demonstration school, and 1 story, basement central heating plant, to Bracker Constr. Co., 1008 Builders Exch., Minneapolis. Est. $765,000. Noted Feb. 20.

Neb., Lincoln—Bonacum Institute, St. Mary's Cathedral, 1408 Sharp Bldg., 3 story, basement, 211 x 218 ft., school and 3 story, basement 33 x 80 ft. convent, brick, stone, concrete, terra cotta, to W. J. Assenmacher, 625 North 17th St. Est. $250,000. Noted July 16.

N. H., Hanover—Dartmouth College, W. W. Gooding, supt. buildings, reconstructing 2 story, basement, brick hall for classroom unit, plain found., to W. H. Trumbull, Hanover. Est. $150,000.

Pa., Phila.—Thomas, Markin & Kirkpatrick, archts., Architects Bldg., 1 story, basement, gallery, 150 x 183 ft., limestone, granite chapel for Girard College, C. A. Herrick, pres., to Turner Contg. Co., Architects Bldg. Est. $1,500,000. Noted June 25.

R. I., Johnstown (mail Providence)—Town and Superintendent Schools, 2 story, basement, brick, stone school, plain found., Graniteville Sect., to S. Montanero, 174 4th St., Providence. Est. $150,000.

Que., Montreal — Roman Catholic School Comn., 113 Ste. Catherine St. W., new brick, steel, concrete school for St. Bartholomew Parish, to Dansereau Ltd., 1387 Bernard St. W., $219,250.

THEATRES

PROPOSED WORK

Mo., St. Louis—S. R. Wilson, c/o G. R. Bartling, Inc., archts., 802 Paul Brown Bldg., sketches 3 story, basement, 100 x 150 ft., brick, algonite, stone, steel theatre, store, office, 911 North Vandeventer Ave. $300,000.

N. J., Englewood — Corporation, c/o C. M. Taylor, mgr. Englewood Theatre, 48 East Palisade Ave., 2 story, basement, brick, steel, rein.-con. theatre, 16 West Palisade Ave. $150,000. **Maturity probably soon.**

N. J., Ridgewood—T. W. Lamb, archt., 644 8th Ave., New York, rejected bids general contract 2 story, basement, 80 x 190 ft., brick, steel theatre, Ridgewood Ave., for Warner Bros., 321 West 44th St., New York. $250,000. **Maturity in spring.** T. W. Lamb, 644 8th Ave., New York, archt. Noted Apr. 30.

N. Y., Brooklyn—Mansfield Impvt. Co., H. Weingarten, in charge, 596 Fulton St., 2 or more story, 100 x 120 ft., theatre, store, Avenue U and Mansfield Pl. $150,000. **Maturity in late fall or winter.** C. A. Sandbloom, 145 West 45th St., New York, archt. Noted July 9.

BIDS ASKED

Calif., Los Angeles—S. C. Lee, archt., 2404 West 7th St., taking bids rein.-con., brick theatre, Compton Ave., for Fox-West Coast Theatres, Inc., 1609 West Washington St. $200,000. Noted July 2.

BANKS

PROPOSED WORK

Mass., Boston—Boston Five Cents Savings Bank, W. R. Evans, pres., 30 School St., sketches by Parker, Thomas & Rice, 177 State St., altering and constructing bank addition. To exceed $150,000.

N. J., Plainfield—Mid-City Trust Co., 201 Front St., 2 story, basement, brick, steel bank, Watchung Ave. $200,000. Holmes & Winslow, 153 East 38th St., New York, archts. **Maturity about March.** Noted Mar. 26.

N. J., Stone Harbor—First Natl. Bank, H. I. Taylor, bids in spring general contract 1 story, basement, brick, steel. $200,000. I. H. Glaser, 620 Madison Ave., New York, archt. Noted Mar. 12.

N. Y., Dunkirk—Lakeshore Natl. Bank will award general contract after Aug. 1, bank, Central and 4th Sts. Bids in. B. Cunningham, 7 Dey St., New York, archt. Noted July 2.

OFFICES

PROPOSED WORK

N. J., Montclair—H. and D. Harris, 539 Bloomfield Ave., sketches 2 story, basement, brick, steel office, store, Church St. and South Fullerton 9ve. $150,000.

N. Y., New York—Corporation, c/o E. M. Krulewitch, 50 East 42nd St., 60 story office, Financial Dist. $15,000,000. **Maturity indefinite.** Noted May 14.

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N. Y., New York—Lexave Syndicate, c/o J. Milner Co., 285 Madison Ave., 52 story, 165 x 200 ft. office, Lexington Ave, from 46th to 47th Sts. To exceed $15,000,000. **Maturity indefinite.**

N. C., Durham — Medical Building Corp., Durham, plans by Milburn-Heister & Co., Hill Bldg., Wash., D. C., 5 story, 85 x 90 ft., brick, steel, concrete, Indiana limestone office, Chapel Hill St. $250,000.

CONTRACTS AWARDED

Ill., Chicago—Graham, Anderson, Probst & White, archts., 80 East Jackson Blvd., 45 story, 189 x 322 ft., brick, steel, stone office, store, to George A. Fuller Co., 140 South Dearborn St., for Marshall Field Estate, 232 South Clark St. Est. $12,000,000. (First unit, 100 x 189 ft. to start about end of year.) Noted June 19.

N. Y., Jamaica—Harriman Building Corp., c/o Morrill Smith, archt., 161-18 Jamaica Ave., 10 story office, to Kuhn, Lincoln, Smith & Harris, 205 West 34th St., New York. Est. exceeds $300,000. Noted July 2.

N. J., Newark — W. O. Bartlett, archt., 22 Commerce St., Newark, general contract 2 story, basement, brick, steel office, 372 Plane St., to Oschwald Constr. Co., 854 Clinton Ave., for Newark Dist. Telegraph Co., 790 Broad St.; plumbing, to Jaehnig & Peoples, 221 13th Ave.; heating, to J. H. Nelles Co., 835 Springfield Ave., Irvington; electrical work, to Shaw Electric Co., 102 Central Ave., Newark. Est. $150,000.

STORES

PROPOSED WORK

N. Y., New York—N. Wilson, 232 Madison Ave., 12 story, basement store, apartment, 315-323 East 56th St. $500,000.

Pa., Pittsburgh—Richman Bros. Co., 1600 East 55th St., Cleveland, O., plans by R. M. Trimble, Commonwealth Annex, and soon takes bids 5 story, basement, 20 x 120 ft. and 25 x 186 ft., brick, steel clothing store, 5th Ave. $250,000.

BIDS ASKED

N. J., Asbury Park—C. B. Cook, archt., 505 Bond St., bids about Aug. 1, general contract 2 story, basement, brick, steel store, office, for J. Ackerman, 404 Asbury Ave. $150,000. Noted July 9.

Ore., Portland—J. W. DeYoung, archt., Portland, bids about Sept. 9, 6 story, basement, rein.-con., timber store, office, Washington and 6th Sts., for Washington Building Co., Portland. $300,000 or more.

CONTRACTS AWARDED

Conn., Waterbury—Howland-Hughes Co., 122-140 Bank St., 5 story, 60 x 90 ft., brick, steel store addition, to Tracy Bros. Co., 52 Benedict St. Est. $150,000.

PUBLIC

PROPOSED WORK

Mass., Greenfield—COURT HOUSE—Franklin Co., A. G. Burnham, Comr., soon takes bids 2 story, basement, brick, steel, plain found., Main and Hope Sts. To exceed $150,000. E. O. & G. C. Gardner, and F. W. King, 33 Lyman St., Springfield, archts. Noted Mar. 26.

Mich., Grand Rapids—CIVIC AUDITORIUM —City plans by Robinson & Campau, Grand Rapids, fireproof civic auditorium. $250,000 Smith, Hinchman & Grylls, Marquette Bldg., Detroit, assoc. archts. Noted July 17, 1930.

N. J., Camden—ARMORY—State Military Bd., State House, Trenton, sketches by T. Daly, Camden, Naval Militia Armory, 3 story, basement, brick, steel, Pyne Point Rd. $150,000.

N. J., East Orange—FIRE HEADQUARTERS —Bd. City Council, City Hall, plans by W. F. Bower, 437 Main St., 2 story, basement, brick, steel, Main St. $150,000. Noted July 16.

N. J., Jersey City—ART MUSEUM—Bd. City Comrs., City Hall, 2 story, basement, brick, steel. $150,000. **Maturity probably in September.** Architect not appointed. Noted July 9.

N. J., Montclair — LIBRARY — Bd. City Trustees, 2 story, basement, brick, steel, plain found., Church St. and Valley Rd. $150,000. **Maturity about November.** F. Nelson, 15 West 38th St., New York, archt. Noted Dec. 18 Daily.

N. Y., Brooklyn—FIRE HOUSE—Fire Dpt., J. J. Dorman, comr., Municipal Bldg., New York, soon takes bids general contract two 2 story fire houses, one at South 2nd St. and Driggs Ave., other at Avenue N and East 64th St. $150,000. Noted July 9.

N. Y., Brooklyn—HEALTH CENTER—Dpt. Health, 505 Pearl St., health center, baby clinic, dental laboratory, Graham and Maujor Aves. $150,000. **Maturity in fall or winter.** Architect not appointed. Noted Mar. 26.

N. C., Raleigh — PRISON — State Building Comn., fireproof prison at Polk Prison Farm. $400,000. Architect not appointed.

BIDS ASKED

Calif., Tehachapi—DETENTION—Aug. 4, by State Dpt. P. Wks., Sacramento, 2 story, 17,500 sq.ft. floor space, rein.-con., at Women's State Institution.

N. Y., New York—OFFICE—July 29, by Superintendent P. Wks., Div. Architecture, State Office Bldg., Albany, additional work for State Office Building, 80 Centre St.; adv. E.N.-R July 23.

CONTRACTS AWARDED

Conn., Newtown—ASYLUM—State, Fairfield State Hospital, Old Senate Chamber, State House, Hartford, general contract 2nd group buildings for new insane asylum, incl. reception hospital, general hospital, dining hall, nurses' home, married employes home, male employes home, female employes home, 5 staff houses, all rein.-con., steel, brick, to H. Wales Lines Co., 134 State St., Meriden, $1,388,736; electrical work, to Silverstone & Ervin, Inc., 26 Arch St., Bridgeport, $89,727; plumbing, to Wm. P. Kirk Co., 749 Main St., Bridgeport, $197,248; heating and ventilating, to Libby & Blinn, 135 Sheldon St., Hartford, $97,450. Grand total $773,161. Noted June 11.

N. H., West Stewartstown—ALMSHOUSE—Coos County Farm, W. W. James, Hogdon Bldg., Berlin, 3 story, basement, brick, steel, to S. Durson & Sons, Inc., 5 Loring St., Lawrence, Mass. Est. $150,000-$200,000. Noted June 4.

N. Y., Rochester—ADMINISTRATION, etc.—Rochester Port Development, W. E. Andrews, city purch. agt., 110 x 270 ft. administration building and transit shed, to Stewart & Bennett, 126 North Water St., Rochester, $114,665; quay wall, to I. M. Luddington Sons, Inc., Powers Bldg., $188,276.

UNCLASSIFIED

PROPOSED WORK

N. J., Elizabeth—MAUSOLEUM—Owner, c/o F. A. Reed, archt., 1221 East Grand St., steel, brick, granite mausoleum. $150,000. **Maturity probably soon.**

N. J., Hackensack—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, telephone exchange. $150,000. Project in abeyance. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Feb. 19.

N. J., Passaic—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, brick, steel, Prospect St. Project in abeyance, until late winter. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Mar. 12.

N. J., Plainfield—EXCHANGE—New Jersey Bell Telephone Co., 132 West 2nd St., brick, steel central office, Park Ave. and West 5th St. $150,000. Project in abeyonce. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Mar. 19.

N. Y., Brooklyn—MAUSOLEUM—Mausoleum of Cemetery of Holy Cross, 75 Green Ave., soon takes bids superstructure mausoleum, Snyder and Canarsie Aves. $190,000. J. B. Webb, 10 East 43rd St., archt. Founds. awarded, to Renny-Gilzean Constr. Co., 20 Vesey St., New York, Noted July 9.

N. Y., Glens Falls—EXCHANGE—New York Telephone Co., 140 West St., New York, bids probably in August, general contract telephone exchange. $150,000. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts.

N. D., Devils Lake—MEMORIAL and COURT HOUSE—Ramsey Co. defeated $190,000 for memorial building and court house. Noted June 25.

O., Cincinnati — NEWSPAPER — Cincinnati Times-Star Publishing Co., 6th and Walnut Sts., soon lets contract 18 story newspaper publishing building, 8th St. and Bway. $1,500,000. Samuel Hannaford & Son, Dixie Terminal Bldg., archts. Noted Nov. 20.

Okla., Oklahoma City — PASSENGER and EXPRESS DEPOT—Atchison, Topeka & Santa Fe R.R. Co., G. W. Harris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., soon takes bids 1 and 2 story, basement, 104 x 386 ft., rein.-con., stone, steel, California and Santa Fe Aves. $500,000.

BIDS ASKED

Ill., Chicago — FINE ARTS—Aug. 10, by South Park Comrs., at office M. E. Connelly, secy., 57th St. and Cottage Grove Ave., completing interior of restoration of Fine Arts Building which is 4 blocks long, 2 blocks wide, in Jackson Park, Graham, Anderson, Probst, White, 80 East Jackson Blvd., archts.

N. Y., New York—HEALTH CENTER—Dpt. Health, 505 Pearl St., bids about Aug. 15, general contract health center, 349 East 140th St. $150,000. H. K. Murchison, 101 Park Ave., New York, archt. Noted June 11.

O., Columbus—EXCHANGE—July 30, by Ohio Bell Telephone Co., 750 Huron Rd., Cleveland, 1 story,, basement, 77 x 7 7ft., rein.-con., Berea sandstone. Upper Arlington Sect. $200,000.

CONTRACTS AWARDED

N. Y., Brooklyn—MAUSOLEUM—See "Proposed Work."

N. Y., Jamestown—RAILROAD STATION—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, 1 and 2 story, brick, steel, concrete passenger station, to Winston Bros. Co., 1470 Northwestern Bank Bldg., Minneapolis, Minn., and Oliver Bldg., Pittsburgh, Pa., $266,483. Est. $250,000. Noted Jan. 22.

R. I., Providence — MAUSOLEUM — M. J. Perry, 52 Power St., mausoleum Swan Point Cemetery to Hegeman-Harris Co., Inc., 185 Devonshire St., Boston, Mass. **Maturity later.** Noted June 4.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ill., Chicago—MILK STATION, etc.—Sidney Wanzer & Sons, 124 West Garfield Ave., plans by R. Griesser, 64 West Randolph St., 1 and 2 story, 200x148 ft. milk station, incl. refrigerating department, garage, office. Argyle St., near Lincoln St. $125,000.

Factories and Mills (Continued)

Mo., St. Louis — NEWSPAPER PLANT — Midwest Industrial Development Co., c/o Illinois Terminal R.R. Co., A. P. Titus, vice pres., 314 Shell Bldg., 5 story, basement, sub-basement, rein.-con., brick, stone, High, 12th and Morgan Sts. **Maturity in spring.** F. D. Chase, Inc., 720 North Michigan Ave., Chicago, Ill., archt. Star Chronicle Publishing Co., E. Roberts, publisher, 12th and Olive Sts., lessee. Noted July 2.

N. Y., Brooklyn—FACTORY—Dropkin & Flicker Realty Corp., Porter Ave. and Cherry St., plans by S. Goldsmith, 4914 Church Ave., factory and industrial plant, Porter Ave. and Cherry St. $40,000 incl. equipment.

N. Y., Brooklyn—FACTORY—T. Lupo, 913 Grand St., will not build 1 story, basement, 125 x 176 ft. silk dyeing plant, Waterbury and Meadow Sts. $40,000. Project abandoned. Noted Apr. 30.

B. C., Port Renfrew—MILL—Lone Star Timber, Lumber & Pulp Co., B. A. Grover, pres., Pioneer Drug Co. Bldg., Seattle, Wash., pulp mill, sawmill, shingle mill and veneer plant, steel, rein.-con. $6,000,000-$8,000,000.

BIDS ASKED

Ind., Indianapolis — FACTORY — See "Contracts Awarded."

N. J., Bogota—INDUSTRIAL—F. L. Smith, engr. and archt., 21 East 40th St., New York, taking bids general contract 1 and 2 story, basement, brick, steel, rein.-con., for G. M. Brewster & Son, 253 West Fort Lee Rd. $40,000 or more.

N. J., Burlington—BULK PLANT—July 25, by Standard Oil Co. of New Jersey, Brunswick Ave., Linden, 60 x 95 ft., two 40 x 40 ft., and 20 x 30 ft. bulk plants, all 1 and 2 story, brick, steel, plain founds. $150,000. Private plans.

N. J., Linden—FACTORY—July 25, by Atlantic Romper Co., Inc., 50 Atlantic Ave., Elizabeth, and J. Anderson, archt., 251 North Broad St., Elizabeth, 1 story, basement, brick, steel factory. $40,000. Noted June 11.

N. J., Paterson — INDUSTRIAL PLANT — Owner, c/o J. C. Van Vlandren, archt., 140 Market St., bids about Aug. 1, general contract 2 story, basement, brick, steel. $40,000 or more.

CONTRACTS AWARDED

Ind., Indianapolis—FACTORY—Dilling Candy Co., West Morris St., brick, steel addition, Morris and Chocolate Sts., day labor.

Mass., Everett — LABORATORY — Merrimac Chemical Co., Chemical Lane, 2 story, basement, irregular sized, brick, steel laboratory, concrete found., to John Griffin Co. Inc., 250 Stuart St., Boston. Est. $50,000.

Mass., Hyde Park—FACTORY—Royal Curtain Mfg. Co., 35 Kingston St., Boston, 2 story timber, concrete, to M. Slotnick, 333 Washington St., Boston. Est. $40,000. Noted June 25.

N. J., Newark—MANUFACTURING PLANT—Bd. City Comrs., City Hall, 1 story, basement, brick, steel, concrete, Port Newark, to Commonwealth Constr. Co., Inc., 816 Bway. Est. $40,000. Reliable Box & Lumber Co., 65 Avenue A, lessee. Noted June 18.

N. Y., Brooklyn—FACTORY—National Saw Dust Co., 69 North 6th St., 2 story, basement, 25x100 ft. factory, to C. Salenger, 192 Freeman St. Est. $40,000. Noted June 18.

N. Y., Brooklyn—VARNISH FACTORY—Hilo Varnish Corp., Marcy and Flushing Aves., general contract 3 story, part basement, rein.-con. factory, three 1 story, steel buildings for storage, varnish cooking and thinning, to Turner Constr. Co., Graybar Bldg., New York.

N. Y., Buffalo—FACTORY—E. B. Green & Son, and Hopkins, archts., 1 Niagara Sq., 1 story, 85 x 250 ft., brick, steel, 60 Cherry St., to Hydro Constr. Co., Stock Exch. Bldg., for A. F. Oliver Gear & Machine Co., 60 Cherry St. Est. $30,000.

Tex., Amarillo—BAKERY—C. J. Patterson Corp., 4050 Penn St., Kansas City, Mo., 1 story, 70 x 110 ft., brick bakery plant. $60,000. Owner builds. Private plans.

Wis., Milwaukee—COOLER — Plankington Packing Co., Muskego Ave. and Canal St., general and plumbing contracts 5 story, 89x138x183 ft., brick, steel, concrete, to Hunzinger Constr. Co., 424 East Wells St. Est. $500,000.

GARAGES

PROPOSED WORK

Mass., Brighton (sta. Boston)—City of Boston, Dpt. P. Buildings, sketches by J. M. Gray, 175 High St., Boston, 1 story, concrete garage for Police Station 14, Washington St. $40,000.

Mass., Pittsfield—Pittsfield Electric Co., W. A. Whittlesey, pres., 92 Renne Ave., soon lets contract altering and constructing 3 story, brick, steel garage and service building addition, plain found., Pearl and Eagle Sts. $50,000. Private plans. Noted July 2.

N. Y., Brooklyn—M. Astorita, 302 Sackett St., 2 story service garage, 3rd Pl. and Court St. $75,000. I. Brooks, 16 Court St., archt. **Maturity about December or later.** Noted July 9.

N. Y., New York—Kenjohn Realty Corp., K. P. Steinrich, pres., 362 West 23rd St., will not build 6 story, basement service garage, 435 West 25th St. $400,000. Project abandoned. L. E. Dell, Bogota, N. J., archt. Noted Jan. 22.

BIDS ASKED

Mo., St. Louis—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Phoenix — Voted $25,000, water supply.

CONTRACTS AWARDED

Ind., Indianapolis — Standard Oil Co., 137 West 11th St., brick, steel super-service garage, 5665 East Washington St., to Krebay Constr. Co., 108 East Pratt St. Est. $40,000.

Ind., West Lafayette—Standard Oil Co., brick, steel, super-service station, West Main St., to W. Jackson, 1919 Congress St., Lafayette. Est. $40,000.

Mass., Barnstable—E. H. Corson, 6th and Elm Sts., 1 story, basement, 65 x 100 ft., brick, stone, steel service station, showroom, concrete found., to Geo. Howard & Sons, 888 Purchase St., New Bedford. Est. $50,000 or more. Noted July 9.

Mo., St. Louis—Weinberg Constr. Co., Wainright Bldg., 7th and Chestnut Sts., 5 story, basement, 80 x 100 ft., brick, rein.-con. garage, 712-18 Morgan St., own forces. $150,000.

N. Y., Brooklyn—Camstall Constr. Co., M. Stolitsky, pres., 50 Court St., 1 story, basement, 100 x 105 ft. service garage, 88th St. and 4th Ave., separate contracts. $40,000. P. Freshman, 50 Court St., archt. Noted July 9.

N. Y., Long Island City—Kalbirt Realty Corp., 26 Court St., Brooklyn, service garage, 148th St. and Archer Ave., separate contracts. $40,000. **Maturity indefinite.** P. Freshman, 26 Court St., Brooklyn, archt. Noted July 2.

N. Y., New York—Randco Realty Co., C. Alpern, secy., service garage and market, Tiffany St. and East Bay Ave., separate contracts, $40,000. Owner now taking bids on materials, etc. N. Rotholz, 155 East 42nd St., archt. Noted Mar. 5.

SHOPS AND FOUNDRIES

PROPOSED WORK

N. Y., Jamestown—FOUNDRY—Jamestown Iron Wks., T. Maher, pres., 11 Shearman Pl., 60 x 100 ft. addition, Taylor St. $50,000.

BIDS ASKED

Mo., Jefferson City—MAINTENANCE—State Hy. Dpt., bids about Aug. 4, thirty 1 story, 41 x 76 ft. maintenance building. $150,000. T. H. Cutler, ch. engr.

N. Y., Newark—SHOP—July 29, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, construction work for service connection to shop (tunnel) Newark State School: adv. E. N.-R. July 23.

CONTRACTS AWARDED

Ind., Terre Haute—SHOP—Vigo Automobile Co., 2 story, basement, brick, steel, rein.-con. machine shop, garage, 8th and Mulberry Sts., to C. H. Garmong, 630 South 25th St. Est. $41,000.

O., Cincinnati—MACHINE SHOP—University of Cincinnati, Clifton Ave., 3 story, basement, 56 x 112 ft., brick, plain found., to Brockmann Bros., Riddle Rd., $100,000. Noted Oct. 30.

Wash., Seattle — MAINTENANCE — S. J. Humes, dir. Hys., Olympia, maintenance and shop building and office building, to Uebel & Gwinn, 515 Central Bldg., $33,564. Noted June 25.

POWER PLANTS

PROPOSED WORK

Ind., Crown Point — City, diesel type light plant for street lighting. Burns & McDonell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mo., St. Louis—See "Waterworks."

Okla., Vinita—City, C. O. Wattenbarger, clk., will not build municipal light and power plant. $250,000. Project abandoned. Did not vote franchise Apr. 21. Noted Nov. 20, 1930 and Mar. 26, 1931.

BIDS ASKED

Arkansas—See "Contracts Awarded."

Kan., Dodge City—Kansas Power Co., c/o K. S. Kilby, genl. mgr. Operating Dpt., Saline, taking bids 2 story, basement, 50 x 125 ft., concrete, brick, steel, Fort Dodge Rd. Sargent & Lundry, 30 North Wacker Dr., Chicago, Ill. Noted June 11.

N. J., Hackensack—Aug. 3, by Bd. Freeholders Bergen Co., Court House, 1 story, basement, brick, steel central heating plant, Hudson St. $40,000. Tilton, Schwanede & Githens, 420 Lexington Ave., New York, archts.

N. Y., Oxford—Aug. 13, by Superintendent Div. Standards & Purchase, Executive Dpt. Capitol, Albany, installing generators and electric service connections in New York State Women's Relief Corps. Home; adv. E.N.-R. July 23.

CONTRACTS AWARDED

Arkansas — Phoenix Utility & Constr. Co., subsidiary Electric Bond & Share Co., M. Larnard, in charge, 2 Rector St., New York, will build hydro-electric plant, incl. concrete dam, on White River, near Cotter, separate contracts. $25,000,000. Noted Dec. 25.

See proposal advertising on page 72

Calif., Pasadena—City Directors, steam condenser for municipal light plant, to Ingersoll-Rand Co. of California, 1460 East 4th St., Los Angeles, $59,750. Noted Mar. 5.

Ia., Toledo—Iowa Railway & Light Corp., Security Bldg., Cedar Rapids, concrete, brick power plant, near here, to J. W. Hopp Constr. Co., Granby Bldg., Cedar Rapids. Est. $40,000. Noted July 31.

Neb., Holdredge—I. Anderson, city clk., feed water regulator, to F. W. Hay & Co., Omaha, $124; sump pump, to Forslund Pump & Mchy. Co., 3031 Main St., Kansas City, Mo., $154; superheater, to Foster-Wheeler Corp., Bd. Trade Bldg., Kansas City, Mo., $2,550; cooling towers, to J. F. Pritchard Co., Dwight Bldg., Kansas City, Mo., $3,055; turbo-generator and switchboard, to General Electric Co., Dwight Bldg., Kansas City, Mo., $21,100 and $759 respectively; surface condenser, to Elliott Co., 724 Union State Bank Bldg., Omaha, Neb., $6,526. Grand total $34,268. Noted June 18.

S. D., Vermilion—City, E. A. Lenhartk, aud. Municipal power plant, incl. engine founds., fuel oil storage, traveling hand power crane, to H. L. Carlson Co., Sioux Falls, $32,121; engines and generators, to Fairbanks-Morse & Co., 900 South Wabash Ave., Chicago, Ill., $56,625. Noted June 18.

WAREHOUSES

PROPOSED WORK

Calif., Los Angeles — Bekins Van & Storage Co., 2690 Geary St., San Francisco, plans by F. E. Barton, Crocker Bldg., San Francisco, rein.-con. warehouse, 4th and Alameda Sts. $100,000.

Conn., New Britain—Hardware City Storage Co., 242 Main St., storage warehouse, $175,000. **Maturity about December.** Kingsley Serv. Co., 103 West 125th St., New York, archts. Noted July 16.

N. J., Newark—New Jersey Bell Telephone Co., 540 Broad St., 6 story, basement, brick, steel warehouse, garage, $750,000. Project in abeyance. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted June 4.

N. Y., New York — One Hundred West End Corp., and New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., warehouse, West End Ave. from 64th and 65th Sts. $1,500,000. DePace & Juster, 151 West 46th St., New York, archts. **Maturity in October.** Noted June 25.

BIDS ASKED

N. J., North Bergen — Owner, c/o G. G. Eicholz, Jr., archt., 960 Bergenline Ave., Union City, bids about Aug. 15, general contract 4 story, basement, 65 x 120 ft., brick, steel warehouse, showroom addition, Hudson Blvd. $150,000. Noted July 16.

CONTRACTS AWARDED

N. Y., New York—W. E. Diller Constr. Co., 912 Grand Concourse, 2 story stockroom, storage, to Babor-Comeau, Grand Central Terminal. Est. $50,000. S. H. Kress & Co., lessee. Noted June 25.

N. Y., New York—Stumpp & Walter, 30 Barclay St., storage and warehouse to Rheinstein Constr. Co., 21 East 40th St. Est. $157,000. Noted June 25.

Business Opportunities

Projects on which services of consulting engineers, engineers or architects will be required.

Dam is to be built across Black River above Manitou Falls, Mich. Project to exceed $100,000. Engineer not yet selected. For details write Business News Department, Engineering News-Record, Tenth Ave. at 36th St., New York.

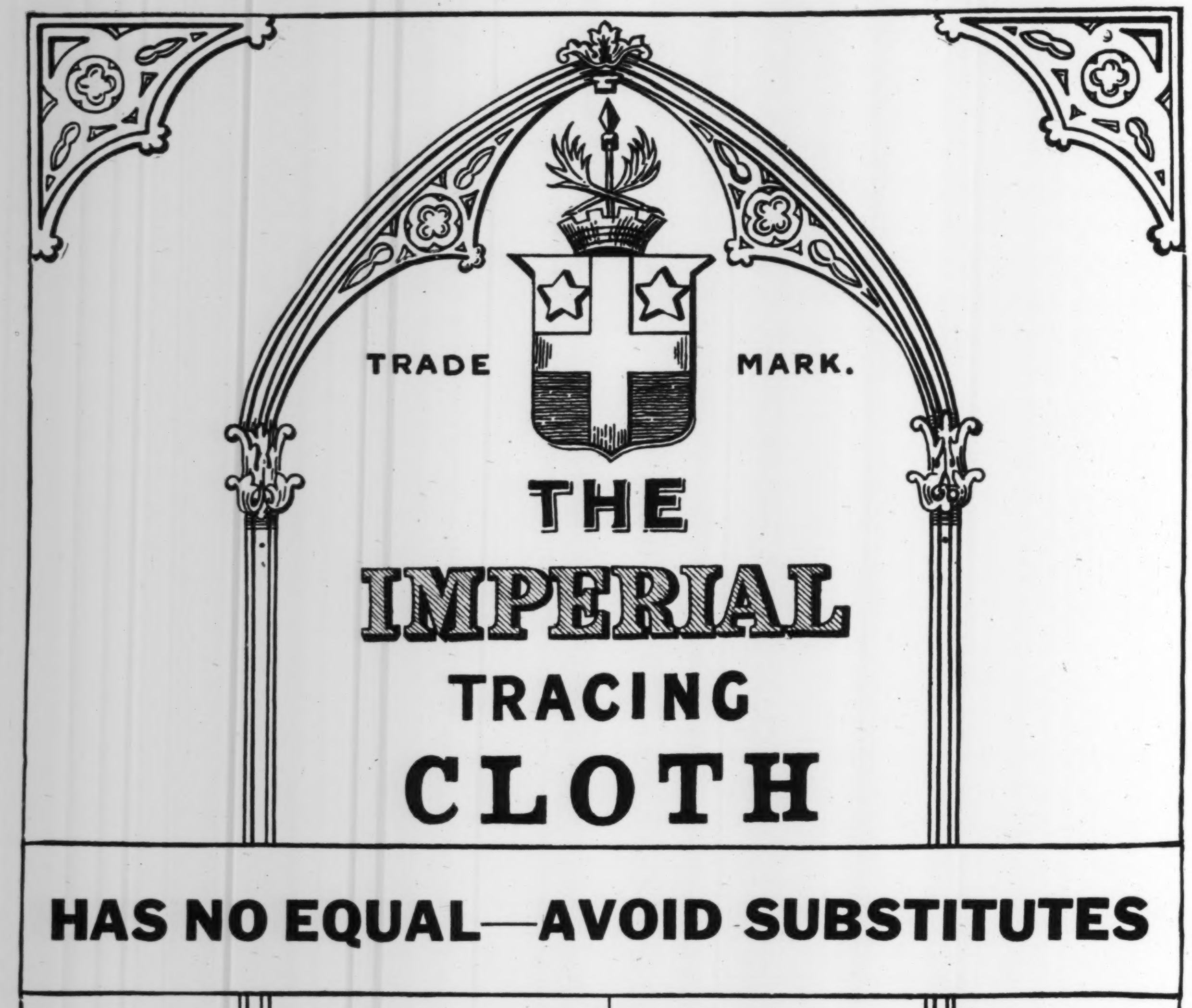
A Michigan city is studying smoke abatement and will employ a consultant. Business News Department, Tenth Ave. at 36th St., New York.

A Northwestern city is discussing additional water supply to be obtained either by a dam or by additional wells. Engineer not difinitely selected. Business News Department, Tenth Ave. at 36th St., New York.

Designs invited until Oct. 5 from Indiana architects for a $1,000,000 state library at Indianapolis. Arthur Bohn, 610 Indiana Trust Bldg.

H. S. Cummins, Surgeon General of U. S. will recommend an additional building for the U. S. Marine Hospital in St. Louis, Mo.

$15,000,000 bond issue for immediate extension of municipal hospital facilities is recommended by Dr. C. H. Lohr, Hospital Comr. in the annual report of H. Salesbury, Dir. Public Welfare.



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